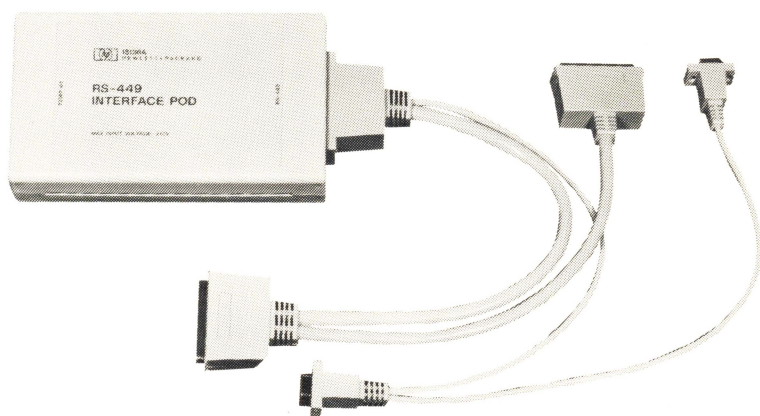


# MODEL 18136A RS-449 INTERFACE POD



HEWLETT  
PACKARD

## SAFETY

*This product has been designed and tested according to International Safety Requirements. To ensure safe operation and to keep the product safe, the information, cautions, and warnings in this manual must be heeded. Refer to Section 1 for general safety considerations applicable to this product.*

## CERTIFICATION

*Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.*

## WARRANTY

This Hewlett-Packard product is warranted against defects in material and workmanship for a period of one year from date of shipment , except that in the case of certain components listed in Section 1 of this manual, the warranty shall be for the specified period . During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

### LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

### EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

## ASSISTANCE

*Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.*

*For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Address are provided at the back of this manual.*





## OPERATING AND SERVICE MANUAL

# **18136A RS-449 INTERFACE POD**

### SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed **2421A**.

For additional important information about serial numbers see **INSTRUMENTS COVERED BY MANUAL** in Section I.

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MANUAL PART NO: 18136-90003  
Microfiche Part No: 18136-90004

PRINTED: MAY 1984

**WARNING****SAFETY**

If this instrument is to be energized via an autotransformer for voltage reduction, make sure the common terminal is connected to the earthed pole of the power source.

**BEFORE SWITCHING ON THIS INSTRUMENT**, the protective earth terminals of this instrument must be connected to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by use of an extension cord (power cable) without a protective conductor (grounding).

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. The use of repaired fuses and the short-circuiting of fuse holders must be avoided.

Whenever it is likely that the protection offered by fuses has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

**GROUNDING**

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting the protective earth terminal can make this instrument dangerous. Intentional interruption is prohibited.

**HIGH VOLTAGE**

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible and, when inevitable, should be carried out only by a skilled person who is aware of the hazard involved.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

Adjustments and service described herein are performed with power supplied to the instrument while protective covers are removed. Energy available at many points, if contacted, result in personal injury.

**CAUTION****LINE VOLTAGE**

**BEFORE SWITCHING ON THIS INSTRUMENT**, make sure instrument requirements match the voltage of the power source.

**GROUNDING**

**BEFORE SWITCHING ON THIS INSTRUMENT**, ensure that all devices connected to this instrument are connected to the protective (earth) ground.

**BEFORE SWITCHING ON THIS INSTRUMENT**, ensure that the line power (mains) plug is connected to a three-conductor line power outlet that has a protective (earth) ground. (Grounding one conductor of a two-conductor outlet is not sufficient.)

IEC SYMBOLS

The following is a list of key IEC symbols used by Hewlett-Packard. All symbols are normally applied adjacent to the device requiring the symbol. They shall not be placed on removable parts likely to be detached or lost.



Instruction Manual symbol: If necessary, to preserve the apparatus from damage it is necessary for the user to refer to the instruction manual, then shall the apparatus be marked with this symbol (IEC 348;16a).



Terminal devices fed from the interior by live voltages that may be dangerous when connecting to or disconnecting from those devices shall be marked with the flash shown when the voltage exceeds 1 KV: The flash shall be red (IEC 348;18c).



Earth Terminals. If the use of this symbol for the protective earth terminal is not permitted by National Standards, it may be modified, for example, by being placed inside a circle (IEC 348;18a).



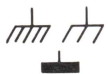
AC current (IEC 117-1, symbol No. 3).



DC current (IEC 117-1, symbol No. 2).



AC or DC current (IEC 117-1, symbol No. 8).



Frame or chassis connection. The hatching may be completely or partly omitted if there is no ambiguity. If the hatching is omitted, the line representing the frame or chassis shall be thicker (IEC 117-1, symbol No. 87).

- A      Ampere (IEC 117-4, symbol No. 356).
- V      Volt (IEC 117-4, symbol No. 357).
- VA     Voltampere (IEC 117-4, symbol No. 358).
- W      Watt (IEC 117-4, symbol No. 360).
- Wh     Watthour (IEC 117-4, symbol No. 361).
- VAh    Voltamperehour (IEC 117-4, symbol No. 362).

Hz      Hertz (IEC 117-4, symbol No. 365).



Contactor, normally closed. In order to avoid confusion with the symbol for a capacitor, the distance between the horizontal (as drawn here) lines should be at least equal to the length of those lines (IEC 117-3, symbol No. 215.2).

In addition the following describes the use of Warnings, Cautions and Notes used in HP Automatic Test System Manuals.

**Warnings, cautions and notes.** (All) Warnings and cautions shall precede the text to which each applies but notes may precede or follow applicable text depending on the material to be highlighted. Warnings, cautions, and notes shall not contain procedural steps nor shall they be numbered. When a warning, caution, or note consists of two or more paragraphs, the heading WARNING, CAUTION, NOTE, shall not be repeated above each paragraph. If it is ever necessary to precede a paragraph by both a warning and a note, or a caution and a note, etc, they shall appear in the sequence as noted, namely, warnings, cautions, notes. Such inserts in the text shall be short and concise and be used to emphasize important and critical instructions.



An operating procedure, practice, etc, which, if not correctly followed, could result in personal injury or loss of life.



An operating procedure, practice, etc, which, if not strictly observed, could result in damage to, or destruction of, equipment.

NOTE: An operating procedure, condition, etc, which it is essential to highlight.

Health hazards precaution data. (All) When hazardous chemicals or adverse health factors, in the environment or use of the equipment cannot be eliminated, appropriate precautionary requirements shall be included.



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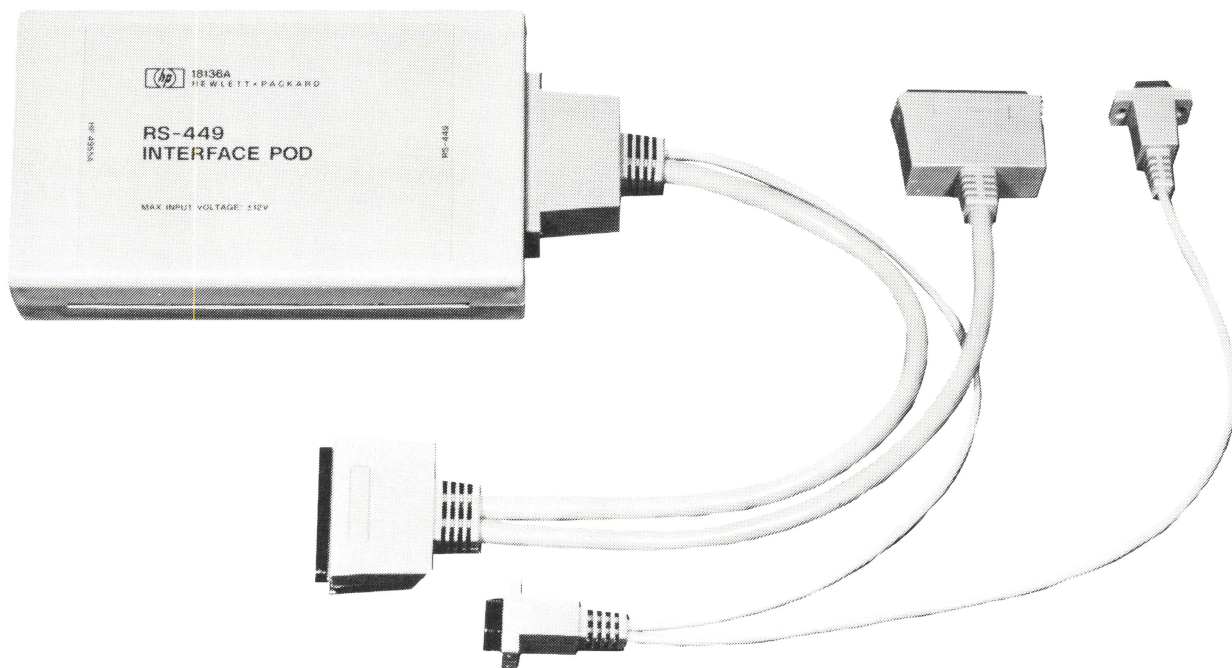


Figure 1-1. HP 18136A RS-449 Interface Pod



## SECTION I GENERAL INFORMATION

### 1-1. INTRODUCTION

This Operating and Service Manual contains information required to install, operate, and service the Hewlett-Packard Model 18136A RS-449 Interface Pod. The Interface Pod is shown in Figure 1-1.

There are eight sections which provide the following information:

**SECTION I, GENERAL INFORMATION**, provides specifications, safety considerations, accessory identification, and a brief description of the accessory.

**SECTION II, INSTALLATION**, provides information for initial inspection, preparation for use, power requirements, operating environment, storage, and shipment.

**SECTION III, OPERATION**, provides cable description, instructions to connect the Interface Pod to the Protocol Analyzer and the network under test, and a brief description of RS-449 standards.

**SECTION IV, PERFORMANCE TESTS**, are performed after the HP Protocol Analyzer is connected to the Interface Pod. The Performance Tests are located in the appropriate HP Protocol Analyzer Service Manual.

**SECTION V, ADJUSTMENTS**, there are no adjustments for the HP 18136A RS-449 Interface Pod.

**SECTION VI, REPLACEABLE PARTS**, provides information required to order all replaceable parts and assemblies.

**SECTION VII, MANUAL CHANGES**, contains information to backdate the manual for earlier accessories and to maintain compatibility with the HP Protocol Analyzer.

**SECTION VIII, SERVICE**, provides service and troubleshooting information. This includes theory of operation, troubleshooting procedures, a block diagram, component locators, and schematics.

### 1-2. SPECIFICATIONS

HP 18136A RS-449 Interface Pod specifications are listed in Table 1-1. These specifications are the performance standards or limits against which the accessory can be tested.

### 1-3. SAFETY CONSIDERATIONS

Whenever internal circuits are exposed, caution must be exercised. Observe all warnings and cautions marked on the accessory or listed in procedures.

## 1-4. INSTRUMENTS COVERED BY MANUAL

This accessory has a two part serial number. The serial number is in the form 0000A00000. The first four digits and the letter comprise the serial number prefix. The last five digits form the sequential suffix unique to each accessory. The content of this manual applies directly to accessories with the same or lower serial number prefix as listed under SERIAL PREFIXES on the title page.

An accessory manufactured after the printing of this manual may have a serial prefix higher than listed on the title page of this manual. This indicates that the Interface Pod has been modified, a yellow Manual Change Sheet will accompany the manual to provide information to adapt the manual to the newer accessory.

**Table 1-1. HP 18136A RS-449 Interface Pod Specifications**

<b>ELECTRICAL:</b>	
Unbalanced Voltage	Balanced Voltage
+4 to +6 V binary 0	A positive w.r.t. B binary 0
-4 to -6 V binary 1	A negative w.r.t. B binary 1
Max. Input Voltage:	$\pm 25\text{VDC}$
Input Impedance:	$>10\text{ kohms}$
Input Threshold:	200 mV
Active Output Voltage:	$-4\text{ to }-6\text{ V} \leq V_o \leq 4\text{ to }6\text{ V}$
<b>PHYSICAL:</b>	
Dimensions:	20.3 cm x 12.4 cm x 3.6 cm
(Interface Pod)	(8" x 4.9" x 1.4")
Weight including cable:	794 gr (28 oz)
Interface Pod Y-Cable length:	46 cm (18 in)
<b>OPERATING:</b>	
Temperature	0°C to +55°C (32°F to 131°F)
Altitude	Up to 4600 metres (15,000 ft)
<b>STORAGE:</b>	
Temperature	-40°C to +75°C (-40°F to 167°F)
Altitude	Up to 15,300 metres (50,000 ft)

## 1-5. DESCRIPTION

The HP 18136A RS-449 Interface Pod provides the connection between the HP Protocol Analyzer and Data Terminal Equipment (DTE) or Data Circuit-Terminating Equipment (DCE). The HP 18136A follows EIA RS-449/422A/423A electrical, mechanical, functional, and procedural specifications.

Figure 1-2 illustrates typical placement of the Interface Pod during monitor mode in a network. The 4955A operates in two modes, as a passive monitor of all data and control signals on a digital link or as a simulator, driving data and control signals to exercise the network or specific components.

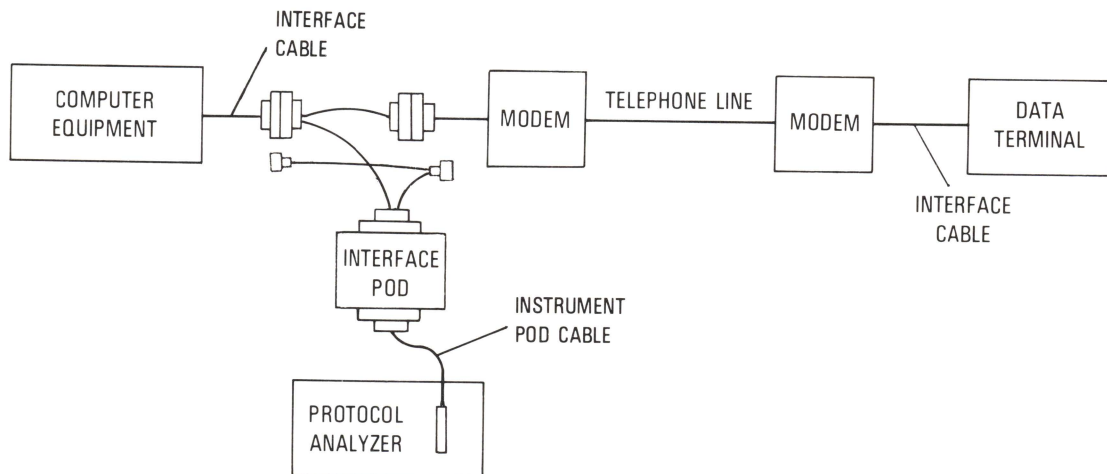


Figure 1-2. Interface Pod in a Typical Monitor Mode Setup

## 1-6. RELATED MANUALS

Operating information for the Protocol Analyzer is located in the appropriate Operating Manual. Service information including Interface Pod Performance Tests is located in the appropriate Service Manual.

## 1-7. USER REPAIR

Internal repairs to the accessory should be performed by authorized Service Centers only. For assistance, contact the nearest Hewlett-Packard Sales and Service Office, listed at the rear of this manual.

## 1-8. WARRANTY

Instrument warranty is as listed on the inside of the front cover.





**SECTION II**  
**INSTALLATION**

**2-1. INTRODUCTION**

This section contains information for initial inspection, preparation for use, power requirements, storage, and shipment of the HP 18136A RS-449 Interface Pod.

**2-2. INITIAL INSPECTION**

Inspect the shipping container for damage. If the container or cushioning material are damaged, keep it. Check the contents of the shipping container for completeness, then check the unit for any physical damage. Refer to the appropriate Protocol Analyzer Service Manual for Performance Tests.

If the unit is physically damaged or fails the Performance Tests, notify the carrier and the nearest Hewlett-Packard office listed at the rear of this manual. Hewlett-Packard will arrange for repair or replacement of the Interface Pod without waiting for claim settlement.

**2-3. PREPARATION FOR USE**

**2-4. POWER REQUIREMENTS**

The Interface Pod requires no external power source.  $\pm 5$  V and  $\pm 12$  V are supplied by the HP Protocol Analyzer through the Instrument Pod cable.



When attaching cables to the Interface Pod always fasten the slide locks to prevent damaging the cables and to assure a good electrical connection.

**2-5. CABLES**

The Interface Pod comes with one cable, the Interface Pod Y-Cable. Table 8-2 gives a complete description of the cable and pinouts.

**2-6. OPERATING ENVIRONMENT**

The Interface Pod should be protected from temperature extremes which can cause condensation in the accessory. It may be stored or shipped in environments within the following limits:

**OPERATING**

Temperature ..... 0°C to +55°C (32°F to 131°F)  
Altitude ..... Up to 4600 metres (15,000 ft)

**NON-OPERATING**

Temperature ..... -40°C to +75°C (-40°F to 167°F)  
Altitude ..... Up to 15,300 metres (50,000 ft)

## 2-7. STORAGE AND SHIPMENT

### 2-8. TAGGING FOR SERVICE

If the accessory is returned to Hewlett-Packard for service, complete one of the blue repair tags located at the end of this manual and attach it to the accessory.

**2-9. Original Packaging.** Containers and packing material identical to those used in factory packaging are available through Hewlett-Packard sales offices. When returning an accessory to Hewlett-Packard for service, complete and attach the blue repair tag. Mark the container FRAGILE to ensure careful handling. In any correspondence, refer to the accessory by model number and serial number.

**2-10. Other Packaging.** Use these general instructions for packaging with commercially available materials:

1. Wrap the accessory in heavy paper or plastic. If shipping to a Hewlett-Packard Sales or Service Office, include a completed blue repair tag.
2. Use a strong shipping container, such as a double-wall carton with 275 lbs burst test.
3. Use a layer of shock absorbing material, 70-100 mm (3-4 in.) thick. This provides a firm cushion and prevents movement inside the container.
4. Seal the carton securely and mark it FRAGILE to ensure careful handling.

## SECTION III OPERATION

### 3-1. INTRODUCTION

This section describes connection of the HP 18136A RS-449 Interface Pod to the HP Protocol Analyzer and the network under test. A brief description of the standard is given. Refer to the appropriate Operating Manual for Protocol Analyzer operating instructions and test routines.

### 3-2. SELF CHECK

A self test routine is automatically performed at power up by the Protocol Analyzer. Interface Pod tests can be performed by selecting the desired test from the Protocol Analyzer menu. Refer to the appropriate Operating Manual for complete instructions.

### 3-3. CABLES

Each Interface Pod is supplied with a unique cable that connects to the network under test. The cable that connects the Interface Pod to the Protocol Analyzer is part of the analyzer. Figure 3-1 shows the Interface Pod cables.

#### CAUTION

Do not perform Pod self test when the Pod is connected to any network device. To do so may damage the network device or the Pod.

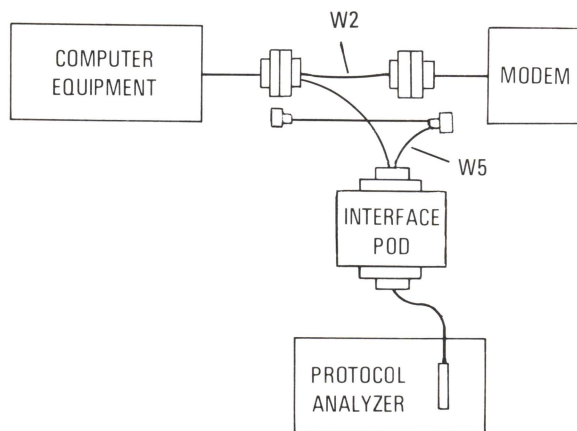


Figure 3-1. Interface Pod Cables

### 3-4. OPERATOR CHECKS

Operation verification is performed with the Interface Pod connected to the HP Protocol Analyzer. Refer to the appropriate Operating Manual for combined Protocol Analyzer and Interface Pod Operator Checks.

### 3-5. OPERATING INSTRUCTIONS

#### CAUTION

Turn off the Protocol Analyzer before disconnecting or connecting any Interface Pod.

### 3-6. SETUP

1. Connect the Instrument Pod cable between the Protocol Analyzer and Interface Pod, and W2 between the Interface Pod and the network under test. The cable connectors are keyed to prevent backwards connections. Figures 3-2 and 3-3 illustrate typical simulate and monitor mode connections.

#### CAUTION

When attaching cables to the Interface Pod always fasten the slide locks to prevent damaging the cables and to assure a good electrical connection.

2. Once the cable is connected to the Interface Pod, it effectively becomes a part of the Protocol Analyzer. Operating instructions are given in the appropriate Operating Manual.

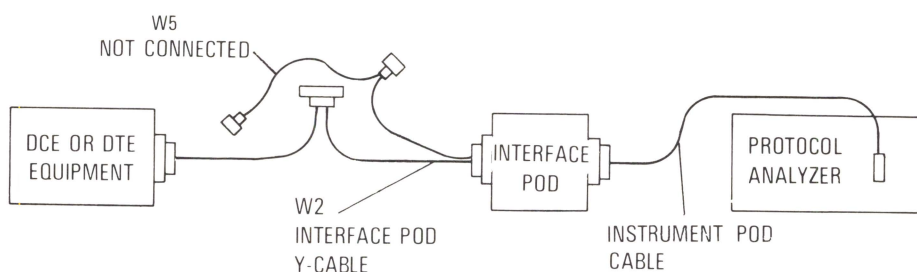
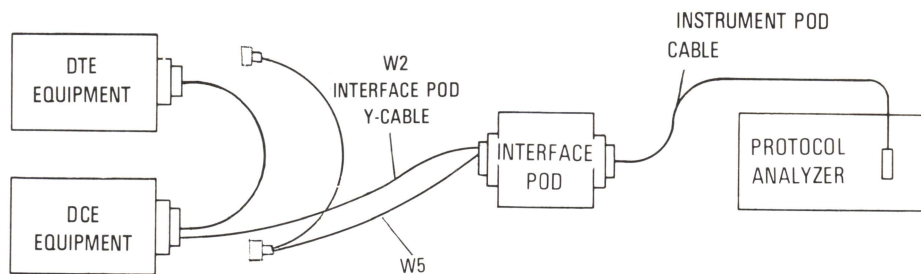


Figure 3-2. Simulate Mode Operation





**Figure 3-3. Monitor Mode Operation**

### 3-7. RS-449 DESCRIPTION

RS-449 specifies the interface between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE). EIA recommended standards RS-449, RS-422A, and RS-423A are collectively referred to in this manual as RS-449.

RS-449 describes functional interchange circuits and the interface cable connector. RS-422A describes the balanced electrical characteristics on interchange circuits SD, RD, TT, ST, RT, RS, CS, TR, DM, and RR (category I circuits). All other interchange circuits use RS-423A unbalanced generators (category II circuits). Balanced differential receivers are as specified by both RS-422A and RS-423A.

The equivalent CCITT recommendation for functional characteristics is V.24, V.11/X.27 for balanced electrical, V.10/X.26 for unbalanced electrical, and ISO 4902 for mechanical. The compatible military standard is MIL-188-114.



## **SECTION IV PERFORMANCE TESTS**

### **4-1. INTRODUCTION**

All tests to verify instrument specifications must be performed with the 18136A Interface Pod connected to the 4955A Protocol Analyzer. Refer to Section IV of the 4955A Service Manual (HP 04955-90004).



## **SECTION V**

### **ADJUSTMENTS**

There are no adjustments for the HP 18136A RS-449 Interface Pod.





## SECTION VI

### REPLACEABLE PARTS

#### 6-1. INTRODUCTION

This section contains replacement parts ordering information. Table 6-1 lists Reference Designator and abbreviations used, Table 6-2 is a manufacturer's code list; Table 6-3 is a list of replaceable parts. Figure 6-1 is an exploded view of the accessory.

#### 6-2. REPLACEABLE PARTS LIST

Table 6-3 lists replaceable parts with the parts given in alphanumeric order. Included is the Reference Designator, HP Part Number, Check Digit, Quantity (total used in accessory), Description, and Manufacturer's Code and Part Number. Chassis and mechanical parts are listed in Figure 6-1.

#### 6-3. ORDERING INFORMATION

To order a listed part, quote the HP Part Number and quantity needed. Address the order to the nearest Hewlett-Packard office. When ordering a part not listed in the manual, include the accessory model number, serial number, and a physical and functional description of the part. Address the order to the nearest Hewlett-Packard office.

**Table 6-1. Reference Designations and Abbreviations**

REFERENCE DESIGNATIONS					
A	= assembly	J	= electrical connector (stationary portion); jack	TB	= terminal board
B	= fan; motor	L	= coil; inductor	TP	= test point
BT	= battery	MP	= misc. mechanical part	U	= integrated circuit; microcircuit
C	= capacitor	P	= electrical connector (movable portion); plug	V	= electron tube; glow lamp
CR	= diode; diode thyristor; varactor	Q	= transistor; SCR; triode thyristor	VR	= voltage regulator; breakdown diode
DL	= delay line	R	= resistor	W	= cable
DS	= annunciator; lamp; LED	RT	= thermistor	X	= socket
E	= misc electrical part	S	= switch; jumper	Y	= crystal unit (piezo- electric or quartz)
F	= fuse	T	= transformer		
FL	= filter				
H	= hardware				

Table 6-1. Reference Designations and Abbreviations (Cont.)

ABBREVIATIONS		
A = amperes	F = female, farads	N.O. = normally open
AC = alternating current	FF = flip-flop	NP = No Polarity
ADD = address	FLM = film	NPN = negative-positive-negative
ADJ = adjust, adjustment	FRNT = front	NPO = negative-positive zero (zero temperature coefficient)
AL = aluminum	FXD = fixed	NRFR = not recommended for field replacement
AR = as required	G = giga ( $10^9$ )	NS = normally shorting, nanosecond
ASM = algorithmic state machine	GE = germanium	NSR = not separately replaceable
ASSY = assembly	GL = glass	NYL = nylon
B = base	GND = ground(ed)	OBD = order by description
BCD = binary coded decimal	GP = General Purpose	OD = outside diameter
BeCu = beryllium copper	GRA = gray	ORN = orange
BIN = binary	GRN = green	P = pico ( $10^{-12}$ )
BLK = black	H = henries	PC = printed circuit
BLU = blue	HDW = hardware	PCA = printed-circuit assembly
BP = band pass	HEX = hexagon, hexagonal, six	PF = picofarad
BRN = brown	HP = high pass	PIV = Peak Inverse Voltage
BRS = brass	HR = hour(s)	PK = peak
BTU = British thermal unit	HZ = Hertz	PNL = panel
C = collector	IC = integrated circuit	PNP = positive-negative-positive
CATH = cathode	ID = inside diameter	P-P = peak-to-peak
CCW = counterclockwise	IF = intermediate frequency	PPM = parts per million
CD PL = cadmium plate	IN. = inch, inches	POLYC = polycarbonate
CER = ceramic	INCAND = incandescent	POLYE = polyethylene
CERMET = ceramic met flm	INCL = include(s)	POLYSTY = polystyrene
CKTS = circuits	INSUL = insulation, insulated	PORC = porcelain
C FLM = carbon film	INT = internal	POSN = position(s)
CLK = clock	INTL = internal	POZI = pozidrive
CLR = clear	K = kilo ( $10^3$ ), kilohm	PRV = peak reverse voltage
CMOS = complementary metal oxide semiconductor logic	LED = light emitting diode	PWV = peak working voltage
COM = common	LFT = left	P/O = part of
COML = commercial	LG = long	R = ring
COMP = composition	LH = lefthand	RAM = random access memory
COMPL = complete	LKWR = lockwasher	ROM = read only memory
COND = conductor	LP = low pass	RECT = rectifier
CONN = connector	LS = low power Schottky	RF = radio frequency
CONT = contact	LSB = least significant bit	RH = right hand
CPRSN = compression	M = milli ( $10^{-3}$ ), male, mega ( $10^6$ ), megohm	RMS = root-mean-square
CTL = complementary-transistor logic	MET FLM = metal film	RND = round
CW = clockwise	MET OX. = metal oxide	RT = right hand
D = diameter	MHZ = megahertz	RTL = resistor-transistor logic
DC = direct current	MFR = manufacturer	RTNT = retainer
DEPC = deposited carbon	MINTR = miniature	RTRY = rotary
DIA = diameter	MISC = miscellaneous	RVT = rivet
DIP = dual in-line package	MOM = momentary	RWV = reverse working voltage
DPDT = double-pole, double-throw	MOS = metal oxide semiconductor	S = second
DPST = double-pole, single-throw	MSB = most significant bit	SB = slow blow
DR = drive	MTCHD = matched	SCR = silicon controlled rectifier
DRVR = driver	MTG = mounting	SE = selenium
DSPL = display	MTLC = metallic	SGL = single
DTL = diode-transistor logic	N = nano ( $10^{-9}$ )	SI = silicon
E = emitter	N.C. = normally closed, no connection	SHK = shank
ECL = emitter-coupled logic	NE = neon	SIP = single in-line package
ELECT = electrolytic	NO. = number	SKT = socket
ENCAP = encapsulated		SLDR = solder
EXT = external		SPCG = spacing
EXTR = extractor		

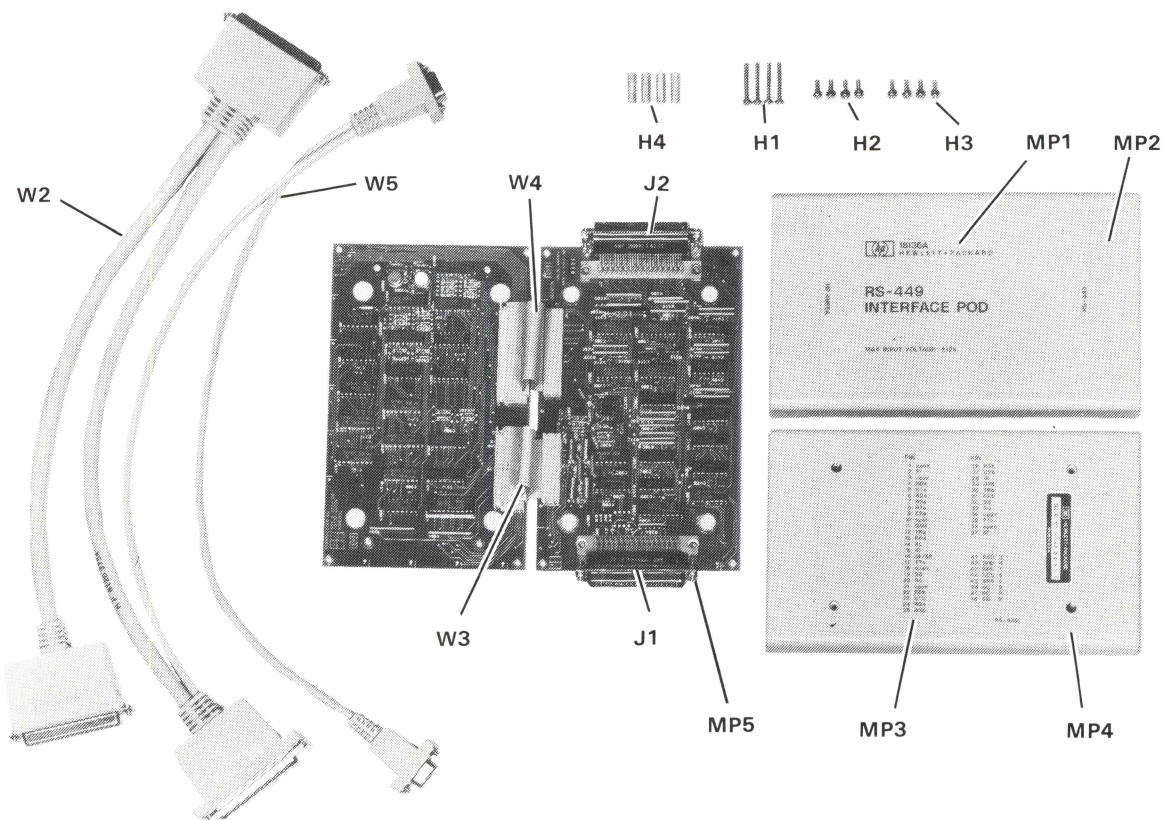
Table 6-1. Reference Designators and Abbreviations (Cont.)

ABBREVIATIONS					
SPDT	=	single-pole, double-throw	TOL	=	tolerance
SPST	=	single-pole, single-throw	TRMR	=	trimmer
SST	=	stainless-steel	TRN	=	turn
STL	=	steel	TTL	=	transistor-transistor logic
SZ	=	size	TYP	=	typical
T	=	tip	U (μ)	=	micro (10 <sup>-6</sup> )
TA	=	tantalum	UF	=	microfarad
TEL	=	telephone	US	=	microseconds
T.C.	=	Temp. Compensated, temp. coefficient			
THKNS	=	thickness	V	=	volt(s)
TI	=	titanium	VAR	=	variable
TGL	=	toggle	VCO	=	voltage controlled oscillator
THD	=	thread	VDCW	=	direct current working volts
THK	=	thick	VIO	=	violet
			VNP	=	no polarity voltage
			W	=	watts
			WT	=	weight
			WW	=	wirewound
			WHT	=	white
			WIP	=	wiper
			WIV	=	working inverse voltage
			WSHR	=	washer
			X	=	times, multiple
			YEL	=	yellow
			ZNR	=	zener
			φ	=	phi, phase

Table 6-2. Manufacturers Code List

MFR NO.	MANUFACTURER NAME	ADDRESS		ZIP CODE
S0545	NIPPON ELECTRIC CO	TOKYO	JP	
00000	ANY SATISFACTORY SUPPLIER			
01121	ALLEN-BRADLEY CO	MILWAUKEE	WI	53204
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS	TX	75222
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD	PA	16701
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA	CA	95051
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO	CA	94304
3L585	RCA CORP SOLID STATE DIV	SOMERVILLE	NJ	
34335	ADVANCED MICRO DEVICES INC	SUNNYVALE	CA	94086
52063	EXAR INTEGRATED SYSTEMS INC	SUNNYVALE	CA	94086
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS	MA	01247





ITEM	HP PART NUMBER	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
MP1	7121-3023	1	TOP COVER LABEL	28480	7121-3023
MP2	5060-7162	1	TOP COVER	28480	5060-7162
MP3	7121-3024	1	BOTTOM COVER LABEL	28480	7121-3024
MP4	5040-4474	1	BOTTOM COVER	28480	5040-4474
MP5	1251-0218	4	LOCKPOST	28480	1251-0218
W2	8120-3754	1	RS-449 Y-CABLE WITH W5 SECONDARY CABLE	28480	8120-3754
W3	5060-7161	1	INTERCONNECT CABLE (W3)	28480	5060-7161
W4	18136-61601	1	INTERCONNECT CABLE (W4)		
J1	1251-8137	1	50 COND D SUBMIN P (J1)		
J2	1251-7571	1	50 COND D SUBMIN S (J2)		
H1	0380-1212	4	SPACER 4-40 .625	0000	ORDER BY DESCRIPTION
H2	2200-0103	4	SCREW, MACH 4-40 .25 in	0000	ORDER BY DESCRIPTION
H3	2200-0107	4	SCREW, MACH 4-40 .375 in	0000	ORDER BY DESCRIPTION
H4	2200-0117	4	SCREW, MACH 4-40 .875 in	0000	ORDER BY DESCRIPTION



Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	18136-60005	3	1	RECEIVER BOARD	28480	18136-60005
A1C10B	0160-3879	7	4	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1C10C	0180-0374	3	4	CAPACITOR-FXD 10UF+-10% 20VDC TA	56269	150D106X9020B2
A1C10D	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A1C11B	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1C11D	0160-0576	5	35	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C12C	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1C12D	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C13C	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1C20B	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C20C	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C20D	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C20E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C20F	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C21C	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56269	150D106X9020B2
A1C21D	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C21E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C21F	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C22D	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C23D	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C24C	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56269	150D106X9020B2
A1C30B	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C30C	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C30E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C30F	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C31E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C31F	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C31G	0160-4810	8	7	CAPACITOR-FXD 330PF ±5% 100 WVDC TC=COG	00901	C774C331J1G5CA
A1C40B	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C40C	0160-4810	8		CAPACITOR-FXD 330PF ±5% 100 WVDC TC=COG	00901	C774C331J1G5CA
A1C40D	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C40E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C40F	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C41C	0160-4810	8		CAPACITOR-FXD 330PF ±5% 100 WVDC TC=COG	00901	C774C331J1G5CA
A1C41D	0160-4810	8		CAPACITOR-FXD 330PF ±5% 100 WVDC TC=COG	00901	C774C331J1G5CA
A1C41E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C41F	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C42C	0160-4810	8		CAPACITOR-FXD 330PF ±5% 100 WVDC TC=COG	00901	C774C331J1G5CA
A1C42D	0160-4810	8		CAPACITOR-FXD 330PF ±5% 100 WVDC TC=COG	00901	C774C331J1G5CA
A1C43C	0160-4810	8		CAPACITOR-FXD 330PF ±5% 100 WVDC TC=COG	00901	C774C331J1G5CA
A1J1	1251-8137	4	1	CONNECTOR 50-COND D SUBMIN P	28480	1251-8137
A1J2	1251-7571	8	1	CONNECTOR 50-COND D SUBMIN S	28480	1251-7571
A1J3	5060-7161	1	1	CABLE-BOARD INTERCONNECT	28480	5060-7161
A1J4	18136-61601	1	1	4 POSITION SHUNT	28480	18136-61601
A1R10D	0698-4441	0	2	RESISTOR 3.745K 1% .125W F TC=0+100	05524	CMF-55-1
A1R11D	0698-7205	0	2	RESISTOR 51.1 1% .05W F TC=0+100	24546	C3-1/8-T0-51R1-F
A1R20B	0698-3155	1	3	RESISTOR 4.64K 1% .125W F TC=0+100	24546	C4-1/8-T0-4641-F
A1R20C	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+100	24546	C4-1/8-T0-4641-F
A1R20D	0698-4441	0		RESISTOR 3.745K 1% .125W F TC=0+100	05524	CMF-55-1
A1R20E	0683-1065	7	4	RESISTOR 10M 5% .25W FC TC=-900/+1100	01607	CB1065
A1R20F	1810-0280	8	2	NETWORK-RES 10-SIP10.0K OHM X 9	01121	210A103
A1R20G	1810-0406	0	13	NETWORK-RES 8-SIP10.0K OHM X 4	01121	208B103
A1R21C	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+100	24546	C4-1/8-T0-4641-F
A1R21D	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+100	24546	C3-1/8-T0-51R1-F
A1R21E	0683-1065	7		RESISTOR 10M 5% .25W FC TC=-900/+1100	01607	CB1065
A1R21F	1810-0406	0		NETWORK-RES 8-SIP10.0K OHM X 4	01121	208B103
A1R22E	1810-0406	0		NETWORK-RES 8-SIP10.0K OHM X 4	01121	208B103
A1R23E	1810-0406	0		NETWORK-RES 8-SIP10.0K OHM X 4	01121	208B103
A1R30A	1810-0366	1	1	NETWORK-RES 6-SIP220.0 OHM X 5	01121	206A221
A1R30B	1810-0363	8	1	NETWORK-RES 6-SIP330.0 OHM X 5	01121	206A331
A1R30C	1810-0347	8	6	NETWORK-RES 8-SIP2.2K OHM X 4	01121	208B222
A1R30D	1810-0347	8		NETWORK-RES 8-SIP2.2K OHM X 4	01121	208B222
A1R30E	0683-1065	7		RESISTOR 10M 5% .25W FC TC=-900/+1100	01607	CB1065
A1R30F	1810-0406	0		NETWORK-RES 8-SIP10.0K OHM X 4	01121	208B103
A1R30G	1810-0406	0		NETWORK-RES 8-SIP10.0K OHM X 4	01121	208B103
A1R31C	1810-0347	8		NETWORK-RES 8-SIP2.2K OHM X 4	01121	208B222
A1R31D	1810-0347	8		NETWORK-RES 8-SIP2.2K OHM X 4	01121	208B222
A1R31E	0683-1065	7		RESISTOR 10M 5% .25W FC TC=-900/+1100	01607	CB1065
A1R31F	1810-0406	0		NETWORK-RES 8-SIP10.0K OHM X 4	01121	208B103
A1R33D	1810-0347	8		NETWORK-RES 8-SIP2.2K OHM X 4	01121	208B222
A1R32D	1810-0347	8		NETWORK-RES 8-SIP2.2K OHM X 4	01121	208B222
A1R40D	1810-0280	8		NETWORK-RES 10-SIP10.0K OHM X 9	01121	210A103
A1R40E	1810-0406	0		NETWORK-RES 8-SIP10.0K OHM X 4	01121	208B103
A1R40F	1810-0406	0		NETWORK-RES 8-SIP10.0K OHM X 4	01121	208B103
A1R41D	1810-0406	0		NETWORK-RES 8-SIP10.0K OHM X 4	01121	208B103
A1R41E	1810-0406	0		NETWORK-RES 8-SIP10.0K OHM X 4	01121	208B103
A1R41F	1810-0406	0		NETWORK-RES 8-SIP10.0K OHM X 4	01121	208B103
A1R42E	1810-0406	0		NETWORK-RES 8-SIP10.0K OHM X 4	01121	208B103
A1U20B	1251-4398	1	1	4 POSITION SHUNT	28480	1251-4398
A1U20C	1820-1144	6	1	IC GATE TTL LS NOR QUAD 2-TNP	01295	SN74LS02N
A1U20D	1826-0065	0	2	IC COMPARATOR PRCN 8-DIP-P PKG	50545	UPC311C
A1U20E	1826-0719	1	4	IC OP AMP PRGMBL QUAD 16-DIP-C PKG	52063	XR346CJ
A1U20F	1826-0719	1		IC OP AMP PRGMBL QUAD 16-DIP-C PKG	52063	XR346CJ

See introduction to this section for ordering information  
 \*Indicates factory selected value

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1U21B	1820-1694	3	1	IC DCDR TTL LS BCD-TO-7-SEG 4-TO-7-LINE	91295	SN74LS48N
A1U21D	1826-0065	0		IC COMPARATOR PRCN 8-DIP-P PKG	S6545	UPC311C
A1U30B	1820-2024	3	2	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
A1U30C	1820-1725	9	3	IC MULTIPLXR ANLG 16-DIP-P PKG	17856	DC508CJ
A1U30D	1820-1725	9		IC MULTIPLXR ANLG 16-DIP-P PKG	17856	DC508CJ
A1U30E	1826-0719	1		IC OP AMP PRGMBL QUAD 16-DIP-C PKG	52063	XR346CJ
A1U30F	1826-0719	1		IC OP AMP PRGMBL QUAD 16-DIP-C PKG	52063	XR346CJ
A1U31B	1820-1725	9		IC MULTIPLXR ANLG 16-DIP-P PKG	17856	DC508CJ
A1U40B	1820-2749	9	2	IC DRVR TTL LS DIFF LINE QUAD	01295	AM26LS31CN
A1U40C	1820-2749	9		IC DRVR TTL LS DIFF LINE QUAD	01295	AM26LS31CN
A1U40D	1820-3283	0	2	IC RCVR TTL LS LINE RCVR QUAD	34335	AM26LS34
A1U40E	1826-0410	9	2	IC OP AMP LOW-BIAS-H-IMPD QUAD 14-DIP-P	01295	TL084CN
A1U40F	1826-0410	9		IC OP AMP LOW-BIAS-H-IMPD QUAD 14-DIP-P	01295	TL084CN
A1U41C	1820-3283	0		IC RCVR TTL LS LINE RCVR QUAD	34335	AM26LS34
<b>A2</b>	18136-60002	4	1	TRANSMITTER BOARD	28480	18136-60002
A2C10C	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2C10E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2C10F	0180-0291	3	2	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A2C11C	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2C20B	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2C20D	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2C20G	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2C21G	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2C30B	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2C30D	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2C30E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2C30F	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2C30G	0180-0291	3		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A2CR20E	1901-0050	3	24	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR20F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR21E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR21F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR22E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR22F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR23E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR23F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR24F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR25F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR26F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR27F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR30D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR30G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR31D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR31G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR32D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR32G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR33D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR33G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR34G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR35G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR36G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR37G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2J3	1251-7335	2	1	SOCKET- 26P W/LATCH	28480	1251-7335
A2J4	1251-5615	7	1	SOCKET- 34P W/LATCH	28480	1251-5615
A2R20A	1810-0272	8	1	NETWORK-RES 10-SIP330.0 OHM X 9	01121	210A331
A2R20G	0698-3442	9	2	RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A2R21G	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R22G	0698-3442	9		RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A2R23G	0757-0424	7	1	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A2R30A	1810-0372	9	1	NETWORK-RES 10-SIP220.0 OHM X 9	01121	210A221
A2U10C	1820-1729	3	5	IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
A2U10D	1820-1729	3		IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
A2U10E	1820-2703	5	5	IC DRVR TTL LINE DRVR QUAD	01698	SN75174N
A2U10F	1820-2703	5		IC DRVR TTL LINE DRVR QUAD	01698	SN75174N
A2U11D	1820-2703	5		IC DRVR TTL LINE DRVR QUAD	01698	SN75174N
A2U20B	1820-1281	2	1	IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	01295	SN74LS139N
A2U20C	1820-1729	3		IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
A2U20D	1820-1729	3		IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
A2U20E	1820-2852	5	6	IC MONOCHIP	28480	1820-2852
A2U20F	1820-2852	5		IC MONOCHIP	28480	1820-2852
A2U20G	1200-0173	5	2	INSULATOR-XSTR DAP-GL	28480	1200-0173
A2U20H	1826-0558	6	1	IC 337 V RCLTR T0-39	27014	LM337H

See introduction to this section for ordering information

\*Indicates factory selected value

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2U21B	1820-1729	3		IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
A2U21E	1820-2852	5		IC MONOCHIP	28480	1820-2852
A2U21G	1200-0173	5		INSULATOR-XSTR DAP-GL	28480	1200-0173
A2U21G	1826-0539	3		IC 317 V RGLTR TO-39	27014	LM317H
A2U30B	1820-2024	3		IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
A2U30C	1820-2852	5		IC MONOCHIP	28480	1820-2852
A2U30E	1820-2703	5		IC DRVR TTL LINE DRVR QUAD	01698	SN75174N
A2U30F	1820-2852	5		IC MONOCHIP	28480	1820-2852
A2U30G	1820-2852	5		IC MONOCHIP	28480	1820-2852
A2U31B	1820-2203	0		IC RCVR TTL LS LINE RCVR QUAD	34335	AM26LS32PC
A2U31E	1820-2703	5		IC DRVR TTL LINE DRVR QUAD	01698	SN75174N
				MISCELLANEOUS PARTS		
	0300-1212	4	4	SPACER- 4-40 .625	00000	ORDER BY DESCRIPTION
	2200-0103	2	4	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0107	6	4	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0117	8	4	SCREW-MACH 4-40 .875-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	7121-3023	8	1	LABEL (TOP COVER)	28480	7121-3023
	7121-3024	9	1	LABEL (BOTTOM COVER)	28480	7121-3024
	8120-3754	1	1	CABLE-Y RS449	28480	8120-3754
	5040-4474	1	1	COVER (BOTTOM)	28480	5040-4474
	5060-7162	2	1	COVER (TOP)	28480	5060-7162

See introduction to this section for ordering information  
 \*Indicates factory selected value





## SECTION VII MANUAL CHANGES

### 7-1. INTRODUCTION

This section contains information to backdate this manual for accessories with serial prefix numbers lower than listed on the title page. It may also contain information about the compatibility of the Interface Pod with the HP 4955A Protocol Analyzer.

### 7-2. MANUAL CHANGES

To adapt this manual to your accessory, make the changes listed in Table 7-1. Changes are listed by serial prefix. Check the accessory assembly date code. If different than listed on the title page, more than one change may be listed in Table 7-1.

For accessory serial prefixes greater than the number listed on the title page, changes will be listed in the yellow MANUAL CHANGE supplement included with this manual.

### 7-3. MANUAL HISTORY

- 2224A: Original configuration for the 18136A pod. Some of these pods did not have C42D, C41D, and C41C kludged to the circuit side of the board. See Service Note 18136A-1 for information on these changes.
- 2339A: Values for resistor packs R30D, R31D, R32D, and R33D were changed in order to correct a problem that was causing false lead indications.
- 2351A: Several resistor values were changed in order to correct a problem with the threshold voltage for switching the lines.
- 2421A: Present configuration for the 18136A pod.

**Table 7-1. Manual Changes**

HP 18136A SERIAL PREFIX	MAKE CHANGES
2224A	1,2
2239A	1,3
2351A	1,4

#### CHANGE 1

Page 6-5, Table 6-3. Replaceable Parts

Delete: A1C31G, A1C40C, A1C42C, and A1C43C

Page 8-14, Figure 8-4. A1 Receiver Component Locator

Replace Figure 8-4. with Figure 7-1. Replacement for A1 Receiver Component Locator



**CHANGE 2**

Page 6-5, Table 6-3. Replaceable Parts

Change: A1 HP Part Number to 18136-60001

Change: A1R10D and A1R20D to read as follows:

0757-0424, CD=7, Qty=2, RESISTOR-FIXED 1.1K OHM 1% .125W, MFR CODE 24546,  
MFR P/N C4-1/8-TO-1101-F

Page 8-15, Figure 8-5. A1 Receiver Schematic Diagram

Replace Figure 8-5. with Figure 7-2. Replacement for A1 Receiver Schematic Diagram

**CHANGE 3**

Page 6-5, Table 6-3. Replaceable Parts

Change: A1 HP Part Number to 18136-60001

Change: A1R30D, A1R31D, A1R32D, and A1R33D to read as follows:

1810-0488, Qty=4, CD=8, NETWORK-RES 8-SIP 4.7K OHM X 4, MFR CODE 28480,  
MFR P/N 1810-0488

Page 8-15, Figure 8-5. A1 Receiver Schematic Diagram

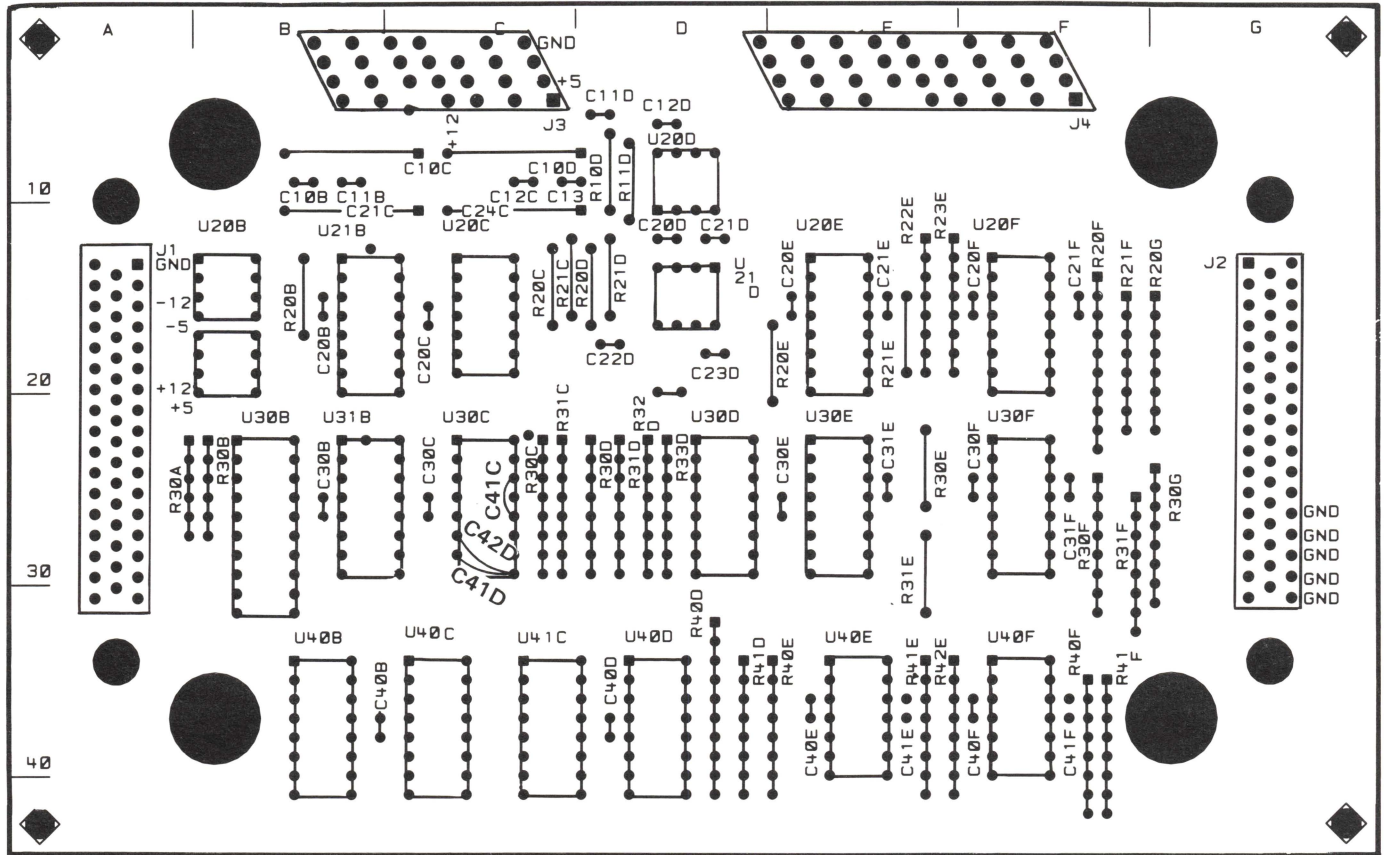
Replace Figure 8-5. with Figure 7-2. Replacement for A1 Receiver Schematic Diagram and then modify as follows:

Change: R30D, R31D, R32D, and R33D (center of schematic) from 2.2K to 4.7K

**CHANGE 4**

Page 8-15, Figure 8-5. A1 Receiver Schematic Diagram

Replace Figure 8-5. with Figure 7-3. Replacement for A1 Receiver Schematic Diagram



18136-60001 0-131-6/83

Note: Components shown in bold are kludged onto the circuit side of the board.

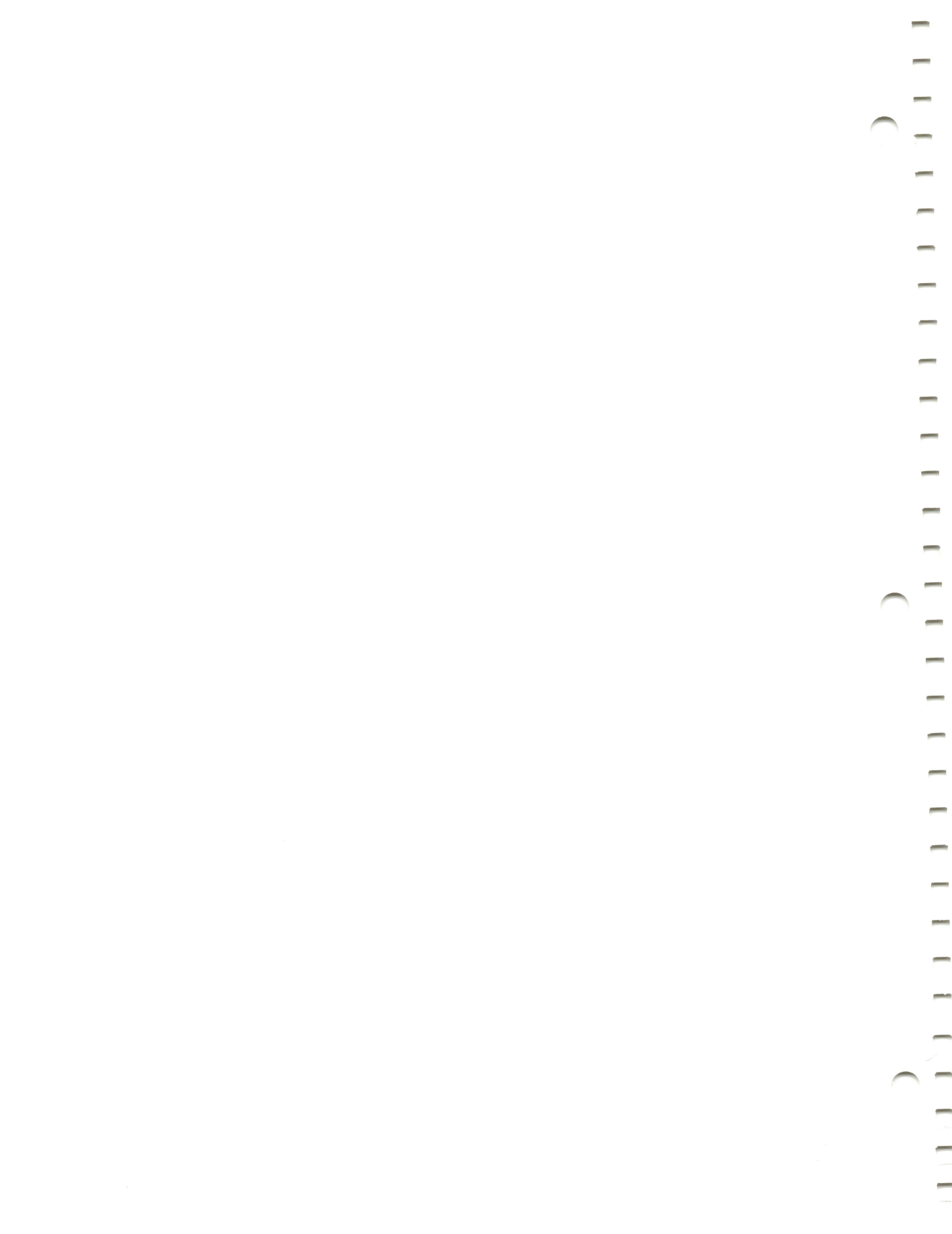
Figure 7-1. Replacement for Figure 8-4. A1 Receiver Component Locator







TO  
PROTOCOL  
ANALYZER





## SECTION VIII

### SERVICE

#### 8-1. INTRODUCTION

This section provides information on the HP 18136A RS-449 Interface Pod. Information includes theory of operation, troubleshooting procedures, a block diagram, component locators, and schematics for each printed circuit assembly.

Table 8-2 lists and describes Interface Pod signal mnemonics.

#### 8-2. DISASSEMBLY/ASSEMBLY PROCEDURES

##### 8-3. DISASSEMBLY



Turn the Protocol Analyzer off before disconnecting or connecting any Interface Pod.

1. Release the slide locks securing the Instrument Pod cable and W2 to the Interface Pod.
2. Unscrew and remove the four posidrive screws on the back of the Interface Pod.
3. Pull the case apart.
4. The Transmitter and Receiver Boards will be exposed. They are held together by two ribbon cables, four standoffs and eight screws. Disconnect the ribbon cables only if required by the troubleshooting procedure.
  - a. To separate the Transmitter and Receiver boards, remove them from the Interface Pod case.
  - b. Remove the four screws from the Receiver or Transmitter Board.
  - c. The boards will split apart, held together by the W3 and W4 cables.

##### 8-4. ASSEMBLY

1. If necessary, reconnect W3 and W4, the ribbon cables between the Transmitter and Receiver Boards.
2. Hold the Transmitter and Receiver Boards with the component sides together. Replace the four standoffs and tighten the eight screws.
3. Orient J1, (the connector attaching the Interface Pod to the cable from the Protocol Analyzer) with the HP label on the Interface Pod. Place the boards onto the pegs in the Interface Pod case.
4. Put the two sides of the Interface Pod case together. Insert the four posidrive screws and tighten.
5. Plug the cable from the Protocol Analyzer into the Interface Pod and cable W2 between the Interface Pod and the network under test.

**CAUTION**

When attaching cables to the Interface Pod, always fasten the slide locks to prevent damaging the cables and to assure a good electrical connection.

## 8-5. THEORY OF OPERATION

The HP 18136A RS-449 Interface Pod connects the HP Protocol Analyzer and the DTE or DCE data lines to be analyzed. There are two modes of operation, monitor and simulate.

### 8-6. A1 RECEIVER BOARD

The Receiver operates in both simulate and monitor mode. In simulate mode, signals originated by the Protocol Analyzer are sent to the network under test. In monitor mode, signals are nonintrusively acquired from the network under test and sent to the Protocol Analyzer for analysis.

The clock and data signals from the network under test pass through level shifters and go to the Protocol Analyzer.

When a signal is selected for analysis, lines PA0-PA4 carry the signal address to the Receiver. The address is decoded by U21B and sent to multiplexers U30D, U30C, and U31B.

Twenty-two circuits (15 control, 7 clock data) from the network under test are sequentially scanned at a 3 usec rate. The balanced input voltage is greater than 500 mV and unbalanced input voltage greater than 1 V for control leads.

The selected signal is multiplexed to the Protocol Analyzer through the mark/space and line status comparators via the MUXDATA signal.

**8-7. Line Status Comparator.** Line status comparator U21D determines if the voltage level of the interface line is active. A signal is active if the voltage level is less than  $-0.5$  volts.

**8-8. Mark/Space Comparator.** Mark/space comparator U20D determines if the voltage level of the interface line is greater than 0.5 volts. If so, the line is defined as a space. If the line is less than 0.5 volts, the line is defined as a mark.

### NOTE

The  $\pm 5V$  on the Interface line will appear at the inputs of U20C and U21D as  $\pm 2.5V$  due to the divide-by-two attenuators.

### 8-9. A2 TRANSMITTER BOARD

The Transmitter allows the Protocol Analyzer to drive one or all of the lines of the network under test in simulate mode only. The following explanation refers to the block diagram in Figure 8-1.

User requested signals are configured by the Data Link Controller Board (DLC) in the Protocol Analyzer. All signals enter the Transmitter Board through cable W3 from the Receiver Board.

Data and clock signals DATA, TXCLK, and RXCLK go directly to the line drivers, and form the data and clock signals.

Control signals on lines LMMIO, PD0-4 and PD6 pass through buffer U30B. These signals and PD7 set up the control signals in the addressable latches. PD0-PD2 are the address select lines. LRESET, LIMMO, PD3, and PD4 are decoded to become latch enables. Data is carried to the driver enable and control line latches by PD6 and PD7. Table 8-1 below describes the line states.

**Table 8-1. PD6 and PD7 States**

PD6	PD7	Line State
1	0	space
1	1	mark
0	X	inactive

From the latches, signals pass to the line drivers. The twelve unbalanced signals go to drivers U30C, U30F, U30G, U20F, U21E, and U20E. Biasing for these IC's is provided by the  $\pm 7$  V power supply. Each line is bit addressable and only one bit can be written to at a time.

Table 8-2. RS-449 Signal Mnemonics

PRIMARY CHANNEL — SIGNAL FLOW FROM A1J2 TO W2				
PROTOCOL ANLAYZER LED INDICATORS	POD SCHEMATIC SIGNAL MNEMONICS	BOTTOM COVER LABEL		DESCRIPTION
		J2/W2 PIN #	NAME	
—	—	1	open	open
SI	SI	2	SI	Signaling-rate Indicator
—	—	3	open	unassigned
DTE	SDa	4	SDa	Send Data (a)
ST	STa	5	STa	Send Timing (a)
DCE	RDa	6	RDa	Receive Data (a)
RS	RSa	7	RSa	Request to Send (a)
RT	RTa	8	RTa	Receive Timing (a)
CS	CSa	9	CSa	Clear to Send (a)
—	—	10	open	open
DM	DMa	11	DMa	Data Mode (a)
TR	TRa	12	TRa	Terminal Ready (a)
RR	RRa	13	RRa	Receiver Ready (a)
RL	RL	14	RL	Remote Loopback
IC	IC	15	IC	Incoming Call
SF	SF/SR	16	SF/SR	Sel. Freq./Signal-rate Sel.
TT	TTa	17	TTa	Terminal Timing (a)
—	—	18	open	open
—	SG	19	SG	Signal Ground
—	RC	20	RC	Receive Common
—	—	21	open	unassigned
DTE	SDb	22	SDb	Send Data (b)
ST	STb	23	STb	Send Timing (b)
DCE	RDb	24	RDb	Receive Data (b)
RS	RSb	25	RSb	Request to Send (b)
RT	RTb	26	RTb	Receive Timing (b)
CS	CSb	27	CSb	Clear to Send (b)
IS	IS	28	IS	Terminal In Service
DM	DMb	29	DMb	Data Mode (b)
TR	TRb	30	TRb	Terminal Ready (b)
RR	RRb	31	RRb	Receiver Ready (b)
SS	SS	32	SS	Select Standby
SQ	SQ	33	SQ	Signal Quality
—	—	34	open	open
TT	TTb	35	TTb	Terminal Timing (b)
—	—	36	open	open
—	—	37	SC	Send Common

Note: J2 pins 38 through 40 are not used.

Table 8-2. RS-449 Signal Mnemonics (cont)

SECONDARY CHANNEL — SIGNAL FLOW FROM A1J2 TO W5					
PROTOCOL ANLAYZER LED INDICATORS	POD SCHEMATIC SIGNAL MNEMONICS	BOTTOM COVER LABEL			DESCRIPTION
		J2 PIN #	NAME	W5 PIN #	
—	SSD	41	SSD	3	Secondary Send Data
—	SRD	42	SRD	4	Secondary Receive Data
SRS	SRS	43	SRS	7	Secondary Request to Send
SCS	SCS	44	SCS	8	Secondary Clear to Send
SRR	SRR	45	SRR	2	Secondary Receiver Ready
—	SC	46	SC	9	Send Common
—	RC	47	RC	6	Receive Common
—	SG	48	SG	5	Signal Ground

Note: J2 pins 49 and 50 are not used.



8-10. RS-449 INTERFACE POD TROUBLESHOOTING USING 4955A PROTOCOL ANALYZER

The Interface Pod test is manually executed from the HP 4955A Performance Verification Test menu. It checks the functionality of all components in the pod except multiplexer A1U30C. All Interface Pod troubleshooting should be performed while the Interface Pod test is running. Disconnect the Pod from the customers network when running the Interface Pod Test. Pod signals can be traced with a scope and control logic can verified with signature analysis.

Run the Interface Pod test:

- 1. If DLC-PP fails, check the following signal paths:  
  
SDa, SDb, RSa, RSb, DMa, DMb, TRa, and TRb. Also check line status and mark/space comparators, A1U20D and A1U21D.
- 2. If CONTROL LEAD fails, check the following signal paths:  
  
SI, SQ, RRa, RRb, IC, SF/SR, IS, RL, SS, SRS, SCS, and SRR.
- 3. If DATA/CLOCK fails, check the following signal paths:  
  
RTa, RTb, STa, STb, TTa, SSD, and SRD.
- 4. If the Interface Pod test passes, but the pod is still suspect, check A1U30C using the following procedure:
  - a. Exit from the HP 4955A Performance Verification menu to obtain the top level menu.
  - b. Select the RUN menu.
  - c. Press EXECUTE. The lead status will be displayed along the top of the display.
  - d. To test A1U30C channels 0-5, connect the following pins, one at a time to +5 V. The corresponding soft LED on the HP 4955A display should change from ✕ to ● as the pin is connected. As each pin is checked, disconnect it and connect the next one.

A1U30C pin number	Soft LED
4	DTE
5	DCE
6	TT
7	ST
12	RT

- 5. If no trouble can be found on the Interface Pod, yet the Interface Pod test fails, check the Pod interface circuit on the A6 DLC board.



**8-11. SIGNATURE ANALYSIS USING 4955A PROTOCOL ANALYZER**

LOOP <u>  A  </u>		PCA <u>  A1 INTERFACE POD RECEIVER  </u>	
TEST CONDITION <u>  4955A INTERFACE POD TEST RUNNING. All 4955A cables connected. Instrument pod cable connected to the pod's A1J1 connector.  </u>			
JUMPERS <u>  NONE  </u>			
SIGNATURE ANALYZER CONNECTIONS ON POD:			
START	<u>  +  </u>	<u>  A1U30B  </u>	<u>  PIN 6  </u>
STOP	<u>  +  </u>	<u>  A1U30B  </u>	<u>  PIN 6  </u>
CLOCK	<u>  +  </u>	<u>  A1U30B  </u>	<u>  PIN 15  </u>
Vh = <u>  0UP7  </u>			
U21B-9 = 0U19 12 = 00U1 13 = 000U U30B-5 = 0000 6 = 0U19 7 = 055H 8 = 000U 10 = 0334 11 = 0334 12 = 000U 13 = 055H 14 = 0U19 15 = 0000			

Before beginning to check signatures for Loop B, verify the Vh signature (5456) by placing the data probe on +5V. If the Vh signature is 0000 instead of 5456, change the clock from – to + and back to minus while the data probe is on +5 V. Do this several times until Vh = 5456. The Signature Multiplexer is now synchronized with the Signature Analysis routine. Check that the clock is on – before continuing.

LOOP <u>  B  </u>		PCA <u>  A2 INTERFACE POD TRANSMITTER BOARD  </u>		
TEST CONDITION <u>  4955A INTERFACE POD TEST RUNNING. All 4955A cables connected, with A6 board on an extender. Instrument Pod cable connected to the pod's A1J1 connector.  </u>				
JUMPERS <u>  NONE  </u>				
SIGNATURE ANALYZER CONNECTIONS ON POD AND 4955A:				
START/STOP	<u>  + / +  </u>	<u>  POD  </u>	<u>  A2U30B  </u>	<u>  PIN 17  </u>
QUALIFIER	<u>  -  </u>	<u>  POD  </u>	<u>  A2U30B  </u>	<u>  PIN 13  </u>
CLOCK	<u>  -  </u>	<u>  4955A  </u>	<u>  A6U60C  </u>	<u>  PIN 6  </u>
Vh = <u>  5456  </u>				
U10C-4 = 72F4 5 = P58C 6 = FC16 7 = 962H 9 = 2F5C 10 = 58C6 11 = C16H 12 = 62HC				

**Loop B Cont'd**

U10D-4 = F5C7  
5 = 8C6P  
6 = 16HF  
7 = 2HC9  
9 = 5C72  
10 = C6P5  
11 = 6HFA

U20B-4 = 0UPP  
5 = 5C47  
6 = 54A9  
11 = 6H34

U21B-4 = 00UP  
5 = 003U  
6 = 007U  
7 = 001U  
9 = 0007  
10 = 000U  
11 = 0003

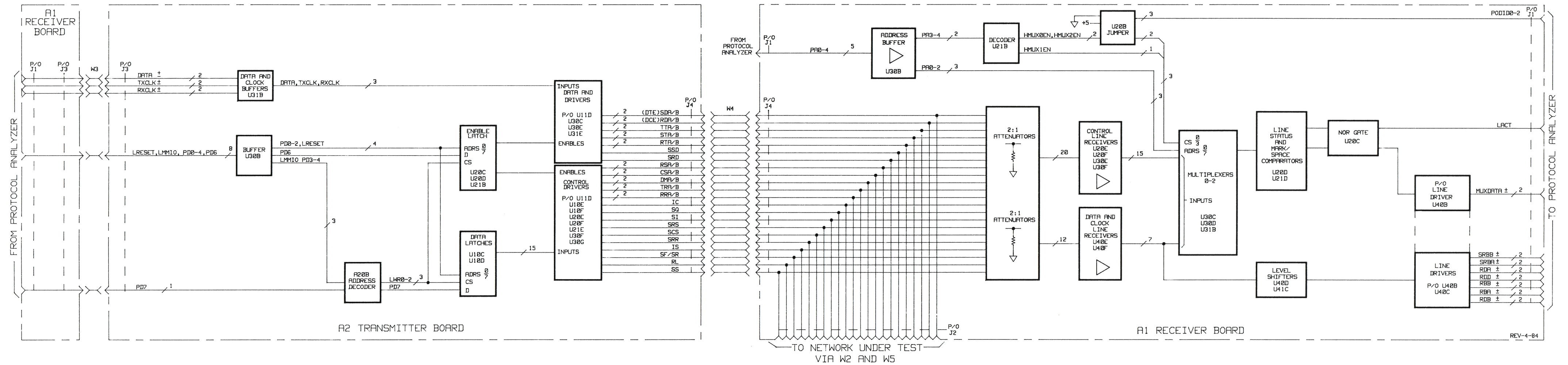
U20C-4 = 7338  
5 = P672  
6 = FFP5  
7 = 99FA  
9 = 3395  
10 = 672A  
11 = FP54  
12 = 9FA8

U20D-4 = 3951  
5 = 72A2  
6 = P545  
7 = FA8A  
9 = 9515  
10 = 2A2C  
11 = 5456

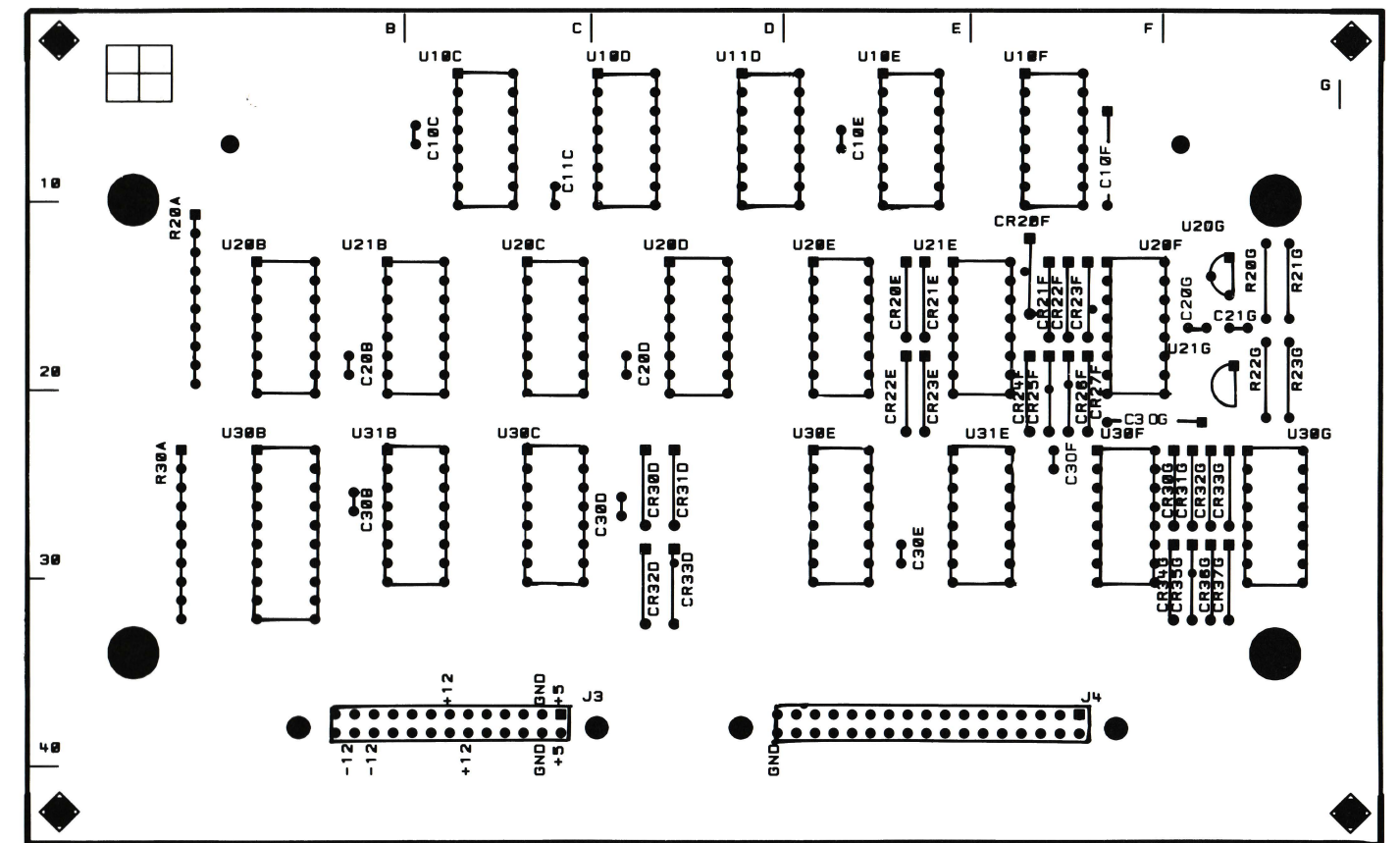
U30B-2 = U53H  
3 = 5456  
4 = 3461  
5 = 5457  
6 = C48C  
7 = 0000  
8 = 0U11  
9 = 00UU  
11 = 00UU  
12 = 0U11  
14 = C48C  
15 = 5457  
16 = 3461  
17 = 5456  
18 = U53H

**8-12. LINE RECEIVER A2U31B VERIFICATION USING 4955A PTOTOCOL ANALYZER**

1. Set up the Signature Multimeter as follows:
  - a. Select function kHz.
  - b. Run the Interface Pod test.
  - c. A 153 kHz signal should be present at A2U31B pins 5 and 11.
2. Use the Multimeter data probe to check that there is activity on A2U31B pin 3.



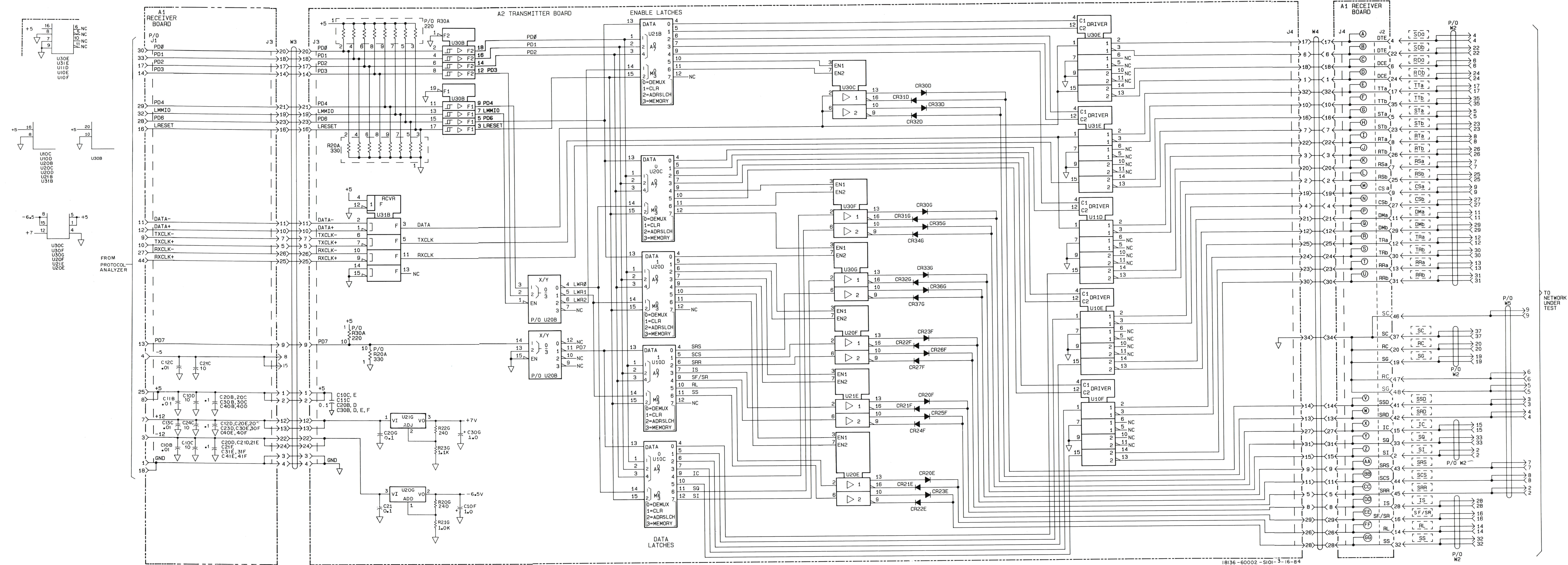
**Figure 8-1. HP 18136A Block Diagram**



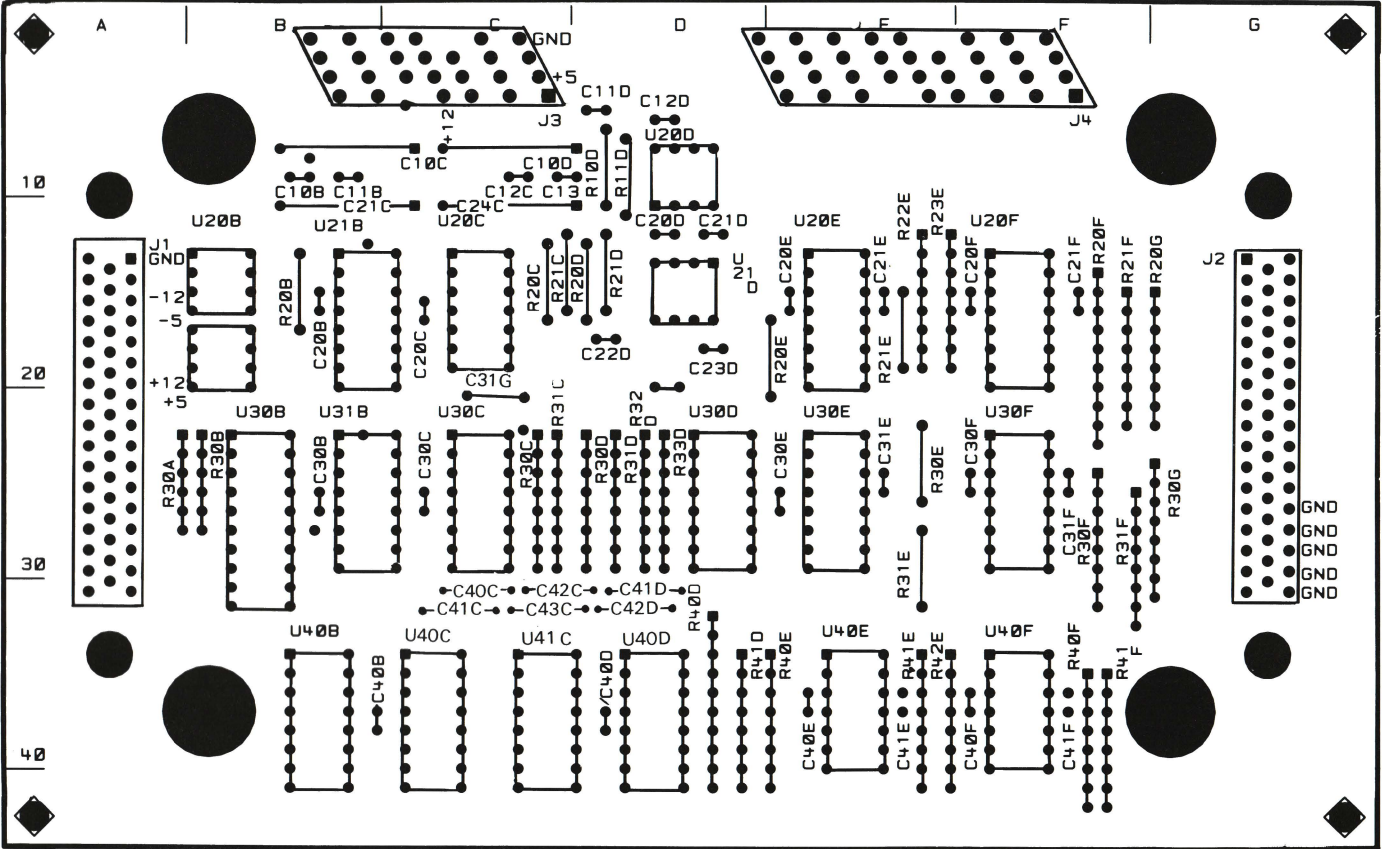
18136-600020-130-6/83

8-12









18136-60005 0-131-3/84

Figure 8-4. A1 Receiver Component Locator

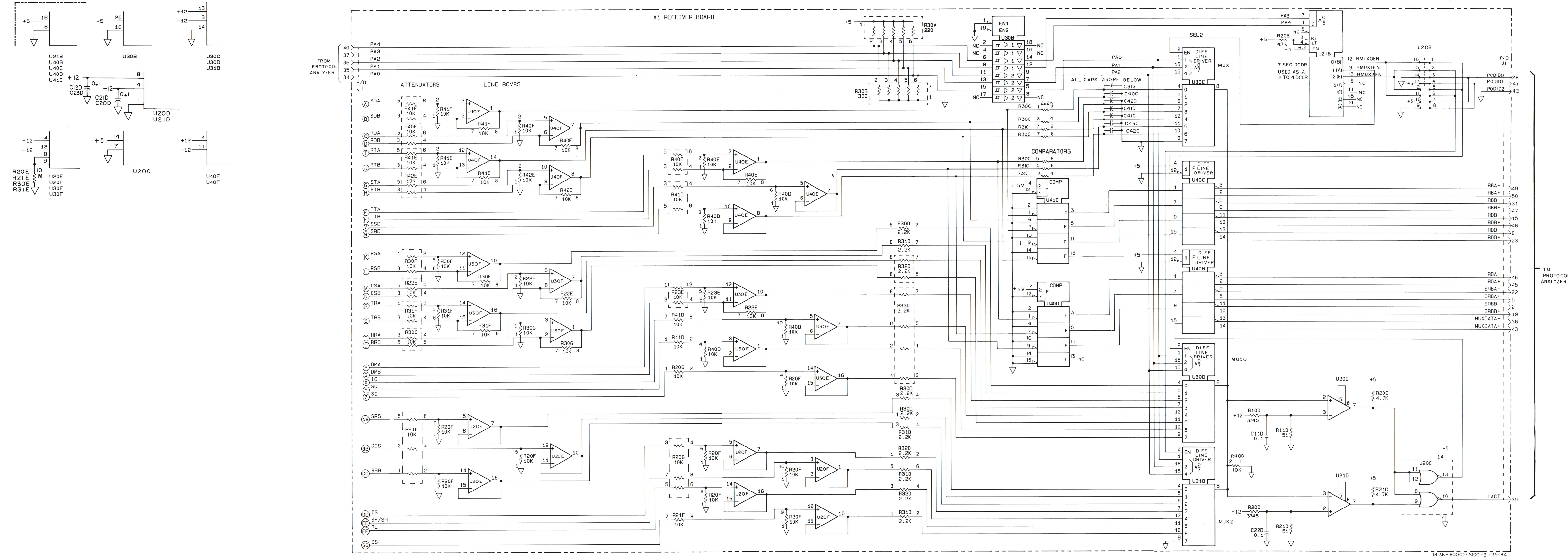


Figure 8-5. A1 Receiver Schematic





## SALES &amp; SUPPORT OFFICES

Arranged alphabetically by country



## Product Line Sales/Support Key

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23855 Research Drive  
**FARMINGTON HILLS, MI** 48024  
Tel: (313) 476-6400  
A,CH,CM,CS,E,MP  
  
Hewlett-Packard Co.  
4326 Cascade Road S.E.  
**GRAND RAPIDS, MI** 49506  
Tel: (616) 957-1970  
CH,CM,CS,MS

**Minnesota**

Hewlett-Packard Co.  
2025 W. Larpenteur Ave.  
**ST. PAUL, MN** 55113  
Tel: (612) 644-1100  
A,CH,CM,CS,E,MP

**Mississippi**

Hewlett-Packard Co.  
P.O. Box 5028  
322 N. Mart Plaza  
**JACKSON, MS** 39216  
Tel: (601) 982-9363  
CM,MS

**Missouri**

Hewlett-Packard Co.  
11131 Colorado Avenue  
**KANSAS CITY, MO** 64137  
Tel: (816) 763-8000  
Telex: 910-771-2087  
A,CH,CM,CS,E,MS

Hewlett-Packard Co.  
1024 Executive Parkway  
**ST. LOUIS, MO** 63141  
Tel: (314) 878-0200  
A,CH,CM,CS,E,MP

**Nebraska**

Hewlett-Packard  
7101 Mercy Road  
Suite 101, IBX Building  
**OMAHA, NE** 68106  
Tel: (402) 392-0948  
CM,MS

**Nevada**

Hewlett-Packard Co.  
Suite D-130  
5030 Paradise Blvd.  
**LAS VEGAS, NV** 89119  
Tel: (702) 736-6610  
CM,MS\*\*

**New Jersey**

Hewlett-Packard Co.  
Crystal Brook Professional Building  
Route 35  
**EATONTOWN, NJ** 07724  
Tel: (201) 542-1384  
A\*,CM,C\*,E\*,P\*  
  
Hewlett-Packard Co.  
W120 Century Road  
**PARAMUS, NJ** 07652  
Tel: (201) 265-5000  
A,CH,CM,CS,E,MP

Hewlett-Packard Co.  
60 New England Av. West  
**PISCATAWAY, NJ** 08854  
Tel: (201) 981-1199  
A,CH,CM,CS,E

**New Mexico**

Hewlett-Packard Co.  
P.O. Box 11634  
11300 Lomas Blvd., N.E.  
**ALBUQUERQUE, NM** 87123  
Tel: (505) 292-1330  
Telex: 910-989-1185  
CH,CM,CS,E,MS

**New York**

Hewlett-Packard Co.  
5 Computer Drive South  
**ALBANY, NY** 12205  
Tel: (518) 458-1550  
Telex: 710-444-4691  
A,CH,CM,E,MS  
  
Hewlett-Packard Co.  
9600 Main Street  
**CLARENCE, NY** 14031  
Tel: (716) 759-8621  
Telex: 710-523-1893  
CH  
  
Hewlett-Packard Co.  
200 Cross Keys Office  
**FAIRPORT, NY** 14450  
Tel: (716) 223-9950  
Telex: 510-253-0092  
CH,CM,CS,E,MS  
  
Hewlett-Packard Co.  
No. 1 Pennsylvania Plaza  
55th Floor  
34th Street & 8th Avenue  
**NEW YORK, NY** 10119  
Tel: (212) 971-0800  
CH,CM,CS,E\*,M\*

Hewlett-Packard Co.  
5858 East Molloy Road  
**SYRACUSE, NY** 13211  
Tel: (315) 455-2486  
A,CH,CM,E,MS

Hewlett-Packard Co.  
3 Crossways Park West  
**WOODBURY, NY** 11797  
Tel: (516) 921-0300  
Telex: 510-222-2183  
A,CH,CM,CS,E,MS

**North Carolina**

Hewlett-Packard Co.  
P.O. Box 15579  
2905 Guess Road (27705)  
**DURHAM, NC** 27704  
Tel: (919) 471-8466  
C,M  
  
Hewlett-Packard Co.  
5605 Roanne Way  
**GREENSBORO, NC** 27409  
Tel: (919) 852-1800  
A,CH,CM,CS,E,MS

**Ohio**

Hewlett-Packard Co.  
9920 Carver Road  
**CINCINNATI, OH** 45242  
Tel: (513) 891-9870  
CH,CM,CS,MS  
  
Hewlett-Packard Co.  
16500 Sprague Road  
**CLEVELAND, OH** 44130  
Tel: (216) 243-7300  
Telex: 810-423-9430  
A,CH,CM,CS,E,MS  
  
Hewlett-Packard Co.  
962 Crupper Ave.  
**COLUMBUS, OH** 43229  
Tel: (614) 436-1041  
CH,CM,CS,E\*



# SALES & SUPPORT OFFICES

Arranged alphabetically by country

## Ohio (Con't)

Hewlett-Packard Co.  
330 Progress Rd.  
DAYTON, OH 45449  
Tel: (513) 859-8202  
A,CH,CM,E\*,MS

## Oklahoma

Hewlett-Packard Co.  
P.O. Box 366  
1503 W. Gore Blvd., Suite #2  
LAWTON, OK 73502  
Tel: (405) 248-4248  
C

Hewlett-Packard Co.  
P.O. Box 32008  
304 N. Meridan Avenue, Suite A  
OKLAHOMA CITY, OK 73107  
Tel: (405) 946-9499  
A\*,CH,CM,E\*,MS

Hewlett-Packard Co.  
Suite 121  
9920 E. 42nd Street  
TULSA, OK 74145  
Tel: (918) 665-3300  
A\*,CH,CM,CS,M\*

## Oregon

Hewlett-Packard Co.  
1500 Valley River Drive, Suite 330  
EUGENE, OR 97401  
Tel: (503) 683-8075  
C

Hewlett-Packard Co.  
9255 S. W. Pioneer Court  
WILSONVILLE, OR 97070  
Tel: (503) 682-8000  
A,CH,CM,CS,E\*,MS

## Pennsylvania

Hewlett-Packard Co.  
1021 8th Avenue  
King of Prussia Industrial Park  
KING OF PRUSSIA, PA 19406  
Tel: (215) 265-7000  
Telex: 510-660-2670  
A,CH,CM,CS,E,MP  
Hewlett-Packard Co.  
111 Zeta Drive  
PITTSBURGH, PA 15238  
Tel: (412) 782-0400  
A,CH,CM,CS,E,MP

## South Carolina

Hewlett-Packard Co.  
P.O. Box 6442  
6941-0 N. Trenholm Road  
COLUMBIA, SC 29260  
Tel: (803) 782-6493  
CH,CM,E,MS  
Hewlett-Packard Co.  
814 Wade Hampton Blvd.  
Suite 10  
GREENVILLE, SC 29609  
Tel: (803) 232-0917  
C

## Tennessee

Hewlett-Packard Co.  
P.O. Box 22490  
224 Peters Road  
Suite 102  
KNOXVILLE, TN 37922  
Tel: (615) 691-2371  
A\*,CH,CM,MS  
Hewlett-Packard Co.  
3070 Directors Row  
MEMPHIS, TN 38131  
Tel: (901) 346-8370  
A,CH,CM,MS  
Hewlett-Packard Co.  
Suite 103  
478 Craighead Street  
NASHVILLE, TN 37204  
Tel: (615) 383-9136  
CM,MS\*\*

## Texas

Hewlett-Packard Co.  
Suite 310W  
7800 Shoalcreek Blvd.  
AUSTIN, TX 78757  
Tel: (512) 459-3143  
CM,E  
Hewlett-Packard Co.  
Suite C-110  
4171 North Mesa  
EL PASO, TX 79902  
Tel: (915) 533-3555  
CH,CM,E\*,MS\*\*  
Hewlett-Packard Co.  
5020 Mark IV Parkway  
FORT WORTH, TX 76106  
Tel: (817) 625-6361  
CM,C\*

Hewlett-Packard Co.  
P.O. Box 42816  
10535 Harwin Street  
HOUSTON, TX 77036  
Tel: (713) 776-6400  
A,CH,CM,CS,E,MP

Hewlett-Packard Co.  
3309 67th Street  
Suite 24  
LUBBOCK, TX 79413  
Tel: (806) 799-4472  
M

Hewlett-Packard Co.  
P.O. Box 1270  
930 E. Campbell Rd.  
RICHARDSON, TX 75081  
Tel: (214) 231-6101  
A,CH,CM,CS,E,MP

Hewlett-Packard Co.  
205 Billy Mitchell Road  
SAN ANTONIO, TX 78226  
Tel: (512) 434-8241  
CH,CM,CS,E,MS

## Utah

Hewlett-Packard Co.  
3530 W. 2100 South Street  
SALT LAKE CITY, UT 84119  
Tel: (801) 974-1700  
A,CH,CM,CS,E,MS

## Virginia

Hewlett-Packard Co.  
P.O. Box 9669  
2914 Hungary Spring Road  
RICHMOND, VA 23228  
Tel: (804) 285-3431  
A,CH,CM,CS,E,MS  
Hewlett-Packard Co.  
P.O. Box 4786  
3110 Peters Creek Road, N.W.  
ROANOKE, VA 24015  
Tel: (703) 563-2205  
CH,CM,E\*\*

Hewlett-Packard Co.  
P.O. Box 12778  
5700 Thurston Avenue  
Suite 111  
VIRGINIA BEACH, VA 23455  
Tel: (804) 460-2471  
CH,CM,MS

## Washington

Hewlett-Packard Co.  
15815 S.E. 37th Street  
BELLEVUE, WA 98006  
Tel: (206) 643-4000  
A,CH,CM,CS,E,MP  
Hewlett-Packard Co.  
Suite A  
708 North Argonne Road  
SPOKANE, WA 99206  
Tel: (509) 922-7000  
CH,CM,CS

## West Virginia

Hewlett-Packard Co.  
4604 MacCorkle Ave., S.E.  
CHARLESTON, WV 25304  
Tel: (304) 925-0492  
A,CM,MS

## Wisconsin

Hewlett-Packard Co.  
150 S. Sunny Slope Road  
BROOKFIELD, WI 53005  
Tel: (414) 784-8800  
A,CH,CM,CS,E\*,MP

## URUGUAY

Pablo Ferrando S.A.C. e.l.  
Avenida Italia 2877  
Casilla de Correo 370  
MONTEVIDEO  
Tel: 80-2586  
Telex: Public Booth 901  
A,CM,E,M  
Guillermo Kraft del Uruguay S.A.  
Av. Lib. Brig. Gral. Lavalleja 2083  
MONTEVIDEO  
Tel: 234588, 234808, 208830  
Telex: 6245 ACTOUR UY  
P

## U.S.S.R.

Hewlett-Packard Co.  
Representative Office  
Pokrovsky Blvd. 4/17 KV12  
MOSCOW 101000 Tel: 294-2024  
Telex: 7825 HEWPACK SU

## VENEZUELA

Hewlett-Packard de Venezuela C.A.  
Apartado 50933  
3A Transversal Los Ruices Norte  
Edificio Segre  
CARACAS 1071  
Tel: 239-4133  
Telex: 25146 HEWPACK  
A,CH,CS,E,MS,P

## YUGOSLAVIA

Iskra-Commerce-Representation of  
Hewlett-Packard  
Sava Centar Delegacija 30  
Milentija Popovica 9  
11170 BEOGRAD  
Tel: 638-762  
Telex: 12042, 12322 YU SAV CEN  
Iskra-Commerce-Representation of  
Hewlett-Packard  
Kopraska 46  
61000 LJUBLJANA  
Tel: 321674, 315879  
Telex:

## ZAIRE

Computer & Industrial Engineering  
25 Avenue de la Justice  
B.P. 10-976  
Kinshasa I/Zaire  
GOMBE  
Tel: 32063  
Telex: 21-457 SGEKIN ZR  
CH,CS

## ZIMBABWE

Field Technical Sales  
45 Kelvin Road, North  
P.B. 3458  
SALISBURY  
Tel: 705 231  
Telex: 4-122 RH  
C,E,M,P

## FOR COUNTRIES AND AREAS NOT LISTED:

### CANADA

Ontario  
Hewlett-Packard (Canada) Ltd.  
6877 Goreway Drive  
MISSISSAUGA, Ontario L4V 1M8  
Tel: (416) 678-9430  
Telex: 610-492-4246

### EASTERN USA

Maryland  
Hewlett-Packard Co.  
4 Choke Cherry Road  
Rockville, MD 20850  
Tel: (301) 258-2000

### MIDWESTERN USA

Illinois  
Hewlett-Packard Co.  
5201 Tollview Drive  
ROLLING MEADOWS, IL 60008  
Tel: (312) 255-9800

### SOUTHERN USA

Georgia  
Hewlett-Packard Co.  
P.O. Box 105005  
450 Interstate N. Parkway  
ATLANTA, GA 30339  
Tel: (404) 955-1500

### WESTERN USA

California  
Hewlett-Packard Co.  
3939 Lankersim Blvd.  
LOS ANGELES, CA 91604  
Tel: (213) 877-1282

## EUROPEAN AREAS NOT LISTED, CONTACT

SWITZERLAND  
Hewlett-Packard S.A.  
7 Rue du Bois-du-Lan  
CH-1217 MEYRIN 2, Switzerland  
Tel: (022) 83-81-11  
Telex: 27835 hpse  
Cable: HEWPACKSA Geneve

## EAST EUROPEAN AREAS NOT LISTED, CONTACT

AUSTRIA  
Hewlett-Packard Ges.m.b.H.  
Wehlstrasse 29  
P.O. Box 7  
A-1205 VIENNA  
Tel: (222) 35-16-210  
Telex: 135823/135066

## MEDITERRANEAN AND MIDDLE EAST AREAS NOT LISTED, CONTACT

GREECE  
Hewlett-Packard S.A.  
Mediterranean & Middle East  
Operations  
Atrina Centre  
32 Kifissias Ave.  
Amaroussion, ATHENS, Greece  
Tel: 808-0359 808-0429  
Telex: 21-6588  
Cable: HEWPACKSA Athens

## INTERNATIONAL AREAS NOT LISTED, CONTACT

OTHER AREAS  
Hewlett-Packard Co.  
Intercontinental Headquarters  
3495 Deer Creek Road  
PALO ALTO, CA 94304  
Tel: (415) 857-1501  
Telex: 034-8300  
Cable: HEWPACK

## FOR COUNTRIES AND AREAS NOT LISTED, CONTACT:

### AFRICA

### NORTHERN AND CENTRAL AFRICA

### SWITZERLAND

Hewlett-Packard S.A.  
7 Rue du Bois-du-Lan  
CH-1217 MEYRIN 2, Switzerland  
Tel: (022) 98-96-51  
Telex: 27835 hpse  
Cable: HEWPACKSA Geneve

### ASIA

### HONG KONG

Hewlett-Packard Asia Ltd.  
6th Floor, Sun Hung Kai Center  
30 Harbor Rd.  
G.P.O. Box 795  
HONG KONG  
Tel: 5-832 3211  
Telex: 66678 HEWPA HX  
Cable: HP ASIA LTD Hong Kong

### EUROPE

### EASTERN EUROPE

AUSTRIA  
Hewlett-Packard Ges.m.b.H.  
Wehlstrasse 29  
P.O. Box 7  
A-1205 VIENNA  
Tel: (222) 35-16-210  
Telex: 135823/135066

### NORTHERN EUROPE

THE NETHERLANDS  
Hewlett-Packard S.A.  
Uilenstede 475  
NL-1183 AG AMSTELVEEN, The Netherlands  
P.O. Box 999  
NL-1180 AZ AMSTELVEEN, The Netherlands  
Tel: 20 437771

### SOUTH EASTERN EUROPE

SWITZERLAND  
Hewlett-Packard S.A.  
7 Rue du Bois-du-Lan  
CH-1217 MEYRIN 2, Switzerland  
Tel: (022) 98-96-51  
Telex: 27835 hpse  
Cable: HEWPACKSA Geneve  
(Offices in the World Trade Center)

## MEDITERRANEAN AND MIDDLE EAST

### GREECE

Hewlett-Packard S.A.  
Mediterranean and Middle East  
Operations  
Atrina Centre  
32 Kifissias Ave.  
Amaroussion, ATHENS, Greece  
Tel: 808-0359 808-0429  
Telex: 21-6588  
Cable: HEWPACKSA Athens

## OTHER INTERNATIONAL AREAS

Hewlett-Packard Co.  
Intercontinental Headquarters  
3495 Deer Creek Road  
PALO ALTO, CA 94304  
Tel: (415) 857-1501  
Telex: 034-8300  
Cable: HEWPACK  
August 1981 5952-6900





Should one of your HP instruments need repair, the HP service organization is ready to serve you. However, you can help us serve you more effectively. When sending an instrument to HP for repair, please fill out this card and attach it to the product. Increased repair efficiency and reduced turn-around time should result.

COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

TECHNICAL CONTACT PERSON \_\_\_\_\_

PHONE NO. \_\_\_\_\_ EXT. \_\_\_\_\_

MODEL NO. \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

MODEL NO. \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

P.O. NO. \_\_\_\_\_ DATE \_\_\_\_\_

Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

OTHER \_\_\_\_\_ over \_\_\_\_\_



Should one of your HP instruments need repair, the HP service organization is ready to serve you. However, you can help us serve you more effectively. When sending an instrument to HP for repair, please fill out this card and attach it to the product. Increased repair efficiency and reduced turn-around time should result.

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ADDRESS \_\_\_\_\_

TECHNICAL CONTACT PERSON \_\_\_\_\_

PHONE NO. \_\_\_\_\_ EXT. \_\_\_\_\_

MODEL NO. \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

MODEL NO. \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

P.O. NO. \_\_\_\_\_ DATE \_\_\_\_\_

Accessories returned with unit

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☐ POWER CABLE ☐ ADAPTER(S)

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COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

TECHNICAL CONTACT PERSON \_\_\_\_\_

PHONE NO. \_\_\_\_\_ EXT. \_\_\_\_\_

MODEL NO. \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

MODEL NO. \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

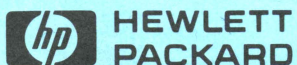
P.O. NO. \_\_\_\_\_ DATE \_\_\_\_\_

Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

OTHER \_\_\_\_\_ over \_\_\_\_\_



Should one of your HP instruments need repair, the HP service organization is ready to serve you. However, you can help us serve you more effectively. When sending an instrument to HP for repair, please fill out this card and attach it to the product. Increased repair efficiency and reduced turn-around time should result.

COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

TECHNICAL CONTACT PERSON \_\_\_\_\_

PHONE NO. \_\_\_\_\_ EXT. \_\_\_\_\_

MODEL NO. \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

MODEL NO. \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

P.O. NO. \_\_\_\_\_ DATE \_\_\_\_\_

Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

OTHER \_\_\_\_\_ over \_\_\_\_\_



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COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

TECHNICAL CONTACT PERSON \_\_\_\_\_

PHONE NO. \_\_\_\_\_ EXT. \_\_\_\_\_

MODEL NO. \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

MODEL NO. \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

P.O. NO. \_\_\_\_\_ DATE \_\_\_\_\_

Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

OTHER \_\_\_\_\_ over \_\_\_\_\_



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COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

TECHNICAL CONTACT PERSON \_\_\_\_\_

PHONE NO. \_\_\_\_\_ EXT. \_\_\_\_\_

MODEL NO. \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

MODEL NO. \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

P.O. NO. \_\_\_\_\_ DATE \_\_\_\_\_

Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

OTHER \_\_\_\_\_ over \_\_\_\_\_



Service needed

☐ CALIBRATION ONLY

☐ REPAIR ☐ REPAIR & CAL

OTHER \_\_\_\_\_

Observed symptoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

FAILURE SYMPTOMS/SPECIAL  
CONTROL SETTINGS \_\_\_\_\_

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If unit is part of system list model  
number(s) of other interconnected in-  
struments. \_\_\_\_\_

\_\_\_\_\_

Printed in U.S.A.

Service needed

☐ CALIBRATION ONLY

☐ REPAIR ☐ REPAIR & CAL

OTHER \_\_\_\_\_

Observed symptoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

FAILURE SYMPTOMS/SPECIAL  
CONTROL SETTINGS \_\_\_\_\_

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If unit is part of system list model  
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struments. \_\_\_\_\_

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Printed in U.S.A.

Service needed

☐ CALIBRATION ONLY

☐ REPAIR ☐ REPAIR & CAL

OTHER \_\_\_\_\_

Observed symptoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

FAILURE SYMPTOMS/SPECIAL  
CONTROL SETTINGS \_\_\_\_\_

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If unit is part of system list model  
number(s) of other interconnected in-  
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Printed in U.S.A.

Service needed

☐ CALIBRATION ONLY

☐ REPAIR ☐ REPAIR & CAL

OTHER \_\_\_\_\_

Observed symptoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

FAILURE SYMPTOMS/SPECIAL  
CONTROL SETTINGS \_\_\_\_\_

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If unit is part of system list model  
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struments. \_\_\_\_\_

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Printed in U.S.A.

Service needed

☐ CALIBRATION ONLY

☐ REPAIR ☐ REPAIR & CAL

OTHER \_\_\_\_\_

Observed symptoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

FAILURE SYMPTOMS/SPECIAL  
CONTROL SETTINGS \_\_\_\_\_

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If unit is part of system list model  
number(s) of other interconnected in-  
struments. \_\_\_\_\_

\_\_\_\_\_

Printed in U.S.A.

Service needed

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☐ REPAIR ☐ REPAIR & CAL

OTHER \_\_\_\_\_

Observed symptoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

FAILURE SYMPTOMS/SPECIAL  
CONTROL SETTINGS \_\_\_\_\_

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If unit is part of system list model  
number(s) of other interconnected in-  
struments. \_\_\_\_\_

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